



DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2016–0121; 4500030113]

RIN 1018–BB46

Endangered and Threatened Wildlife and Plants; Threatened Species Status for Louisiana Pinesnake

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to list the Louisiana pinesnake (*Pituophis ruthveni*), a reptile species from Louisiana and Texas, as a threatened species under the Endangered Species Act (Act). If we finalize this rule as proposed, it would extend the Act's protections to this species.

DATES: We will accept comments received or postmarked on or before [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

Comments submitted electronically using the Federal eRulemaking Portal (see

ADDRESSES, below) must be received by 11:59 p.m. Eastern Time on the closing date.

We must receive requests for public hearings, in writing, at the address shown in **FOR**

FURTHER INFORMATION CONTACT by [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: You may submit comments by one of the following methods:

- (1) *Electronically:* Go to the Federal eRulemaking Portal:

<http://www.regulations.gov>. In the Search box, enter FWS–R4–ES–2016–0121, which is the docket number for this rulemaking. Then, click on the Search button. On the resulting page, in the Search panel on the left side of the screen, under the Document Type heading, click on the Proposed Rules link to locate this document. You may submit a comment by clicking on “Comment Now!”

(2) *By hard copy*: Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R4–ES–2016–0121, U.S. Fish and Wildlife Service, MS: BPHC, 5275 Leesburg Pike, Falls Church, VA 22041-3803.

We request that you send comments only by the methods described above. We will post all comments on <http://www.regulations.gov>. This generally means that we will post any personal information you provide us (see **Information Requested**, below, for more information).

FOR FURTHER INFORMATION CONTACT: Brad S. Rieck, Acting Field Supervisor, U.S. Fish and Wildlife Service, Louisiana Ecological Services Office, 646 Cajundome Blvd., Suite 400, Lafayette, LA; telephone 337-291-3101; facsimile 337-291-3139. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, if we determine that a species is an endangered or threatened species throughout all or a significant portion of its range, we are required to promptly publish a proposed rule in the **Federal Register** and make a determination on our proposal within 1 year. Critical habitat shall be designated, to the

maximum extent prudent and determinable, for any species determined to be an endangered or threatened species under the Act. Listing a species as an endangered or threatened species and designations of critical habitat can only be completed by issuing a rule. We have determined that designating critical habitat for the Louisiana pinesnake is prudent, but not determinable at this time, because the specific information sufficient to perform the required analysis of the impacts of the designation is currently lacking, such as information on areas to be proposed for designation and the potential economic impacts associated with designation of these areas.

This rule proposes to list the Louisiana pinesnake as a threatened species. The Louisiana pinesnake is a candidate species for which we have on file sufficient information on biological vulnerability and threats to support preparation of a listing proposal, but for which development of a listing rule had been, until now, precluded by other higher priority listing activities.

The basis for our action. Under the Act, we may determine that a species is an endangered or threatened species based on any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We have determined that the Louisiana pinesnake is threatened primarily because of the past and continuing loss, degradation, and fragmentation of habitat in association with incompatible silviculture, fire suppression, road and right-of-way construction, and urbanization (Factor A), and the magnified vulnerability of all the small, isolated, genetically compromised extant

populations to mortality from vehicle strikes and from predators (Factors C and E).

We will seek peer review. We will seek comments from independent specialists to ensure that our designation is based on scientifically sound data, assumptions, and analyses. We will invite these peer reviewers to comment on this listing proposal.

Information Requested

Public Comments

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from other concerned governmental agencies, Native American tribes, the scientific community, industry, or any other interested parties concerning this proposed rule. We particularly seek comments concerning:

- (1) The Louisiana pinesnake's biology, range, and population trends, including:
 - (a) Biological or ecological requirements of the species, including habitat requirements for feeding, breeding, and sheltering;
 - (b) Genetics and taxonomy;
 - (c) Historical and current range, including distribution patterns;
 - (d) Historical and current population levels, and current and projected trends; and
 - (e) Past and ongoing conservation measures for the species, its habitat, or both.
- (2) Factors that may affect the continued existence of the species, which may include habitat modification or destruction, overutilization, disease, predation, the inadequacy of existing regulatory mechanisms, or other natural or manmade factors.

(3) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to this species and existing regulations that may be addressing those threats.

(4) Additional information concerning the historical and current status, range, distribution, and population size of this species, including the locations of any additional populations of this species.

(5) Information on activities that might warrant being exempted under section 4(d) of the Act (16 U.S.C. 1531 et seq.). The Service is considering proposing such measures before the final listing determination is published, and will evaluate ideas provided by the public in considering whether such exemptions are necessary and advisable for the conservation of the Louisiana pinesnake.

Please include sufficient information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include.

Please note that submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or threatened species must be made “solely on the basis of the best scientific and commercial data available.”

You may submit your comments and materials concerning this proposed rule by one of the methods listed in **ADDRESSES**. We request that you send comments only by the methods described in **ADDRESSES**.

If you submit information via <http://www.regulations.gov>, your entire submission—including any personal identifying information—will be posted on the website. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on <http://www.regulations.gov>.

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on <http://www.regulations.gov>, or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Louisiana Ecological Services Office (see **FOR FURTHER INFORMATION CONTACT**).

Because we will consider all comments and information we receive during the comment period, our final determination may differ from this proposal.

Public Hearing

Section 4(b)(5) of the Act provides for one or more public hearings on this proposal, if requested. Requests must be received by the date specified in **DATES**. Such requests must be sent to the address shown in **FOR FURTHER INFORMATION CONTACT**. We will schedule public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings, as well as how to obtain reasonable accommodations, in the **Federal Register** and local newspapers at least 15 days before the hearing.

Peer Review

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), we are seeking the expert opinions of six appropriate and independent specialists regarding this proposed rule. The purpose of peer review is to ensure that our listing determination is based on scientifically sound data, assumptions, and analyses. The peer reviewers have expertise in Louisiana pinesnake biology, habitat, physical or biological factors, etc., and they are currently reviewing the status information in the proposed rule, which will inform our determination. We invite comment from the peer reviewers during this public comment period.

Previous Federal Actions

We identified the Louisiana pinesnake (as *Pituophis melanoleucus ruthveni*) as a Category 2 candidate species in the December 30, 1982, Review of Vertebrate Wildlife for Listing as Endangered or Threatened Species (47 FR 58454). Category 2 candidates were defined as taxa for which we had information that proposed listing was possibly appropriate, but for which substantial data on biological vulnerability and threats were not available to support a proposed rule at the time. The species remained so designated in subsequent annual candidate notices of review (CNORs) (50 FR 37958, September 18, 1985; 54 FR 554, January 6, 1989; 56 FR 58804, November 21, 1991; 59 FR 58982, November 15, 1994). In the February 28, 1996, CNOR (61 FR 7596), we discontinued the designation of Category 2 species as candidates; therefore, the Louisiana pinesnake was no longer a candidate species.

We added the Louisiana pinesnake (as *Pituophis melanoleucus*) to the candidate list in 1999 (64 FR 57534, October 25, 1999). Currently, candidate species are defined as

plants and animals for which the Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the Act, but for which development of a listing rule is precluded by other higher priority listing actions. The Louisiana pinesnake was assigned a listing priority number (LPN) of 5, based on the immediacy and magnitude of threats to this species.

In the October 30, 2001, CNOR (66 FR 54808), we recognized the Louisiana pinesnake as *Pituophis ruthveni* and retained an LPN of 5 for the species. The Louisiana pinesnake was included with an LPN of 5 in our subsequent annual CNORs through 2005 (67 FR 40657, June 13, 2002; 69 FR 24876, May 4, 2004; 70 FR 24870, May 11, 2005). In 2006, we changed the Louisiana pinesnake's LPN to 8, based on threats of moderate to low magnitude that were imminent (71 FR 53756; September 12, 2006). In 2007, we again changed the Louisiana pinesnake's LPN, reassigning it an LPN of 5, based on non-imminent, high-magnitude threats (72 FR 69034; December 6, 2007). The Louisiana pinesnake was included with an LPN of 5 in our subsequent annual CNORs through 2015 (73 FR 75176, December 10, 2008; 74 FR 57804, November 9, 2009; 75 FR 69222, November 10, 2010; 76 FR 66370, October 26, 2011; 77 FR 69994, November 21, 2012; 78 FR 70104, November 22, 2013; 79 FR 72450, December 5, 2014; 80 FR 80584, December 24, 2015).

In August 2000, the Service received a petition to list the Louisiana pinesnake as endangered under the Act. No new information was provided in the petition, and we had already found the species warranted listing, so no further action was taken on the petition.

On May 10, 2011, the Service announced a work plan to restore biological priorities and certainty to the Service's listing process. As part of an agreement with one

of the agency's most frequent plaintiffs, the Service filed the work plan with the U.S. District Court for the District of Columbia. The work plan enabled the Service to, over a period of 6 years, systematically review and address the needs of more than 250 species listed within the 2010 CNOR, including the Louisiana pinesnake, to determine if these species should be added to the Federal Lists of Endangered and Threatened Wildlife and Plants. This work plan enabled the Service to again prioritize its workload based on the needs of candidate species, while also providing State wildlife agencies, stakeholders, and other partners with clarity and certainty about when listing determinations will be made. On July 12, 2011, the Service reached an agreement with another frequent plaintiff group and further strengthened the work plan, which allowed the agency to focus its resources on the species most in need of protection under the Act. These agreements were approved on September 9, 2011. Therefore, the timing of this proposed listing is, in part, an outcome of the work plan.

Background

Species Description and Taxonomy

Pinesnakes (genus *Pituophis*) are large, short-tailed, non-venomous, powerful constricting snakes with keeled scales, a single anal plate (the scale covering the cloaca), and disproportionately small heads (Conant and Collins 1991, pp. 201-202). Their snouts are pointed, and they have a large rostral (tip of the snout) scale, both presumably contributing to the snakes good burrowing ability. The Louisiana pinesnake (*P. ruthveni*) has a buff to yellowish background color with dark brown to russet dorsal blotches covering its total length (Vandevert and Young 1989, p. 35; Conant and Collins 1991, p. 203). The belly of the Louisiana pinesnake is unmarked or boldly patterned with black

markings. It is variable in both coloration and pattern, but a characteristic feature is that the body markings on its back are always conspicuously different at opposite ends of its body. Blotches run together near the head, often obscuring the background color, and then become more separate and well-defined towards the tail. Typically, there are no noticeable head markings, although rarely a light bar or stripe may occur behind the eye. The length of adult Louisiana pinesnakes ranges from 48 to 56 inches (in) (122 to 142 centimeters (cm)) (Conant and Collins 1991, p. 203). The largest reported specimen was 5.8 feet (ft) (178 cm) long (Davis 1971, p. 1; Conant and Collins 1991, p. 203).

The Louisiana pinesnake is a member of the Class Reptilia, Order Squamata, Suborder Serpentes, and Family Colubridae. Stull (1929, pp. 2-3) formally described the Louisiana pinesnake as a pinesnake subspecies (*P. melanoleucus ruthveni*) based on two specimens taken in Rapides Parish, Louisiana. Reichling (1995, p. 192) reassessed this snake's taxonomic status and concluded that the Louisiana pinesnake was geographically isolated and phenotypically distinct, and thus a valid evolutionary species. The Louisiana pinesnake has subsequently been accepted as a full species, *P. ruthveni* (Crother 2000, p. 69; Rodriguez-Robles and Jesus-Escobar 2000, p. 46; Collins and Taggart 2002, p. 33). We have carefully reviewed this taxonomic research for the Louisiana pinesnake and conclude that the species is a valid taxon.

Habitat

Louisiana pinesnakes are known from and associated with a disjunct portion of the historic longleaf-dominated (hereafter, "longleaf") pine (*Pinus palustris*) ecosystem that existed in west-central Louisiana and east Texas (Reichling 1995, p. 186). Longleaf pine forests (which are dominated by longleaf, but may also contain other overstory

species such as loblolly and shortleaf pine and sparse hardwoods) have the most species-rich herpetofaunal community compared to other similarly sized and located pine forest habitat in North America, and harbor more species that are specialists of that habitat (Guyer and Bailey 1993, p. 142). Early accounts of Louisiana pinesnake collections indicate a strong affinity for longleaf pine habitat, as most reports indicated the snakes were collected within or adjacent to longleaf pine stands (Fugler 1955, p. 24; Conant 1956, pp. 5, 19, 24; Walker 1965, p. 160; Thomas *et al* 1976, p. 253; Jennings and Fritts 1983, p. 3; Wright and Wright 1994, pp. 622, 623; Jordan 1998, p. 11). The vast majority of natural longleaf pine habitat has been lost or degraded due to conversion to extensive pine plantations and suppression of the historic fire regime. As a result, current Louisiana pinesnake habitat generally consists of sandy, well-drained soils in open canopy pine forest, which may include species such as longleaf, shortleaf, slash, or loblolly pines with a sparse midstory, and well-developed herbaceous ground cover dominated by grasses and forbs (Young and Vandeventer 1988, p. 204; Rudolph and Burgdorf 1997, p. 117).

Abundant ground-layer herbaceous vegetation is important for the Louisiana pinesnake's primary prey, the Bairds pocket gopher (*Geomys breviceps*), which constitutes 75 percent of the Louisiana pinesnake's estimated total prey biomass (Rudolph *et al* 2012, p. 243). Baird's pocket gopher depends mostly on various plant parts of a variety of herbaceous species (Pennoyer 1932, pp. 128-129; Sulentic *et al.* 1991, p. 3). Pocket gopher abundance is associated with a low density of trees, an open canopy, and a small amount of woody vegetation cover, which allow greater sunlight and

more herbaceous forage for pocket gophers (Himes 1998, p. 43; Melder and Cooper 2015, p. 75).

Baird's pocket gophers also create the burrow systems in which Louisiana pinesnakes are most frequently found (Rudolph and Conner 1996, p. 2; Rudolph and Burgdorf 1997, p. 117; Himes 1998, p. 42; Rudolph *et al.* 1998, p. 146; Rudolph *et al.* 2002, p. 62; Himes *et al.* 2006, p. 107), and the snakes use these burrow systems as nocturnal refugia and hibernacula, and to escape from fire (Rudolph and Burgdorf 1997, p. 117; Rudolph *et al.* 1998, p. 147; Ealy *et al.* 2004, p. 386; Rudolph *et al.* 2007 p. 561; Pierce *et al.* 2014, p. 140). From 74 percent to greater than 80 percent of radio-tagged Louisiana pinesnake relocations have been underground in pocket gopher burrow systems (Ealy *et al.* 2004, p. 389; Himes *et al.* 2006, p. 107). In Louisiana, habitat selection by Louisiana pinesnakes seems to be determined by the abundance and distribution of pocket gophers and their burrow systems (Rudolph and Burgdorf 1997, p. 117). Active Louisiana pinesnakes occasionally use debris, logs, and low vegetation as temporary surface shelters (Rudolph and Burgdorf 1997, p. 117; Himes 1998, p. 26; Ealy *et al.* 2004, p. 386); however, most Louisiana pinesnakes disturbed on the surface retreat to nearby burrows (Rudolph and Burgdorf 1997, p. 117). Louisiana pinesnakes also minimally use decayed or burned stumps, or nine-banded armadillo (*Dasypus novemcinctus*) burrows as underground refugia (Ealy *et al.* 2004, p. 389).

Baird's pocket gophers appear to prefer well-drained, sandy soils with low clay content in the topsoil (Davis *et al.* 1938, p. 414). Whether by choice for burrowing efficiency or in pursuit of Baird's pocket gophers (or likely both), Louisiana pinesnakes also occur most often in sandy soils (Wagner *et al.* 2014, p. 152). In Wagner *et al.*'s

study, modelling of Louisiana pinesnake habitat revealed that in addition to suitable forest structure and herbaceous vegetation, specific soil characteristics are an important determinant of Louisiana pinesnake inhabitation. Wagner *et al.* (2014, entire) developed a Landscape-scaled Resource Selection Functions Model of Potential Louisiana Pinesnake Habitat (LRSF-Model) using available Louisiana pinesnake location data with county and parish soil survey data as independent variables to more accurately identify the percentage of certain soil characteristics that were selected from what was available in the landscape, indicating preference. The snakes were found to prefer soils with high sand content and a low water table (Wagner *et al.* 2014, p. 152). In a separate modelling study, using essentially the same dataset but a different study method, Duran (2010, p. 11) also found that Louisiana pinesnakes prefer sandy, well-drained soils, confirming the validity of the LRSF-Model, originally proposed in 2009 (Wagner *et al.* 2009, entire).

The fire-climax park-like conditions of typical Louisiana pinesnake habitat are created and maintained by recurrent, low-intensity ground fires that occur approximately every 3 to 5 years. In the absence of recurrent fire, growth of woody midstory species is increased, and conditions supporting the Louisiana pinesnake's prey species are lost due to shading of herbaceous vegetation. Using radio-telemetry in Bienville Parish, Louisiana, Himes *et al.* (2006, p. 107) recorded wild-caught (i.e., not captive-bred) Louisiana pinesnakes (nine adults and one juvenile) most frequently in pine forests (56 percent), followed by pine plantation (23 percent) and clear-cuts (9 percent). It should be noted, however, that across all sites, snakes appeared to select areas with few large trees (7 to 9 trees per plot) that were approximately 0.1 ac (0.04 ha) in size, resulting in less canopy closure and more light penetration, which supports increased understory

vegetation growth and therefore more pocket gophers (Himes *et al.* 2006, pp. 108-110; 113) regardless of the type of wooded land. In a 2-year (2004-2005) trapping study of three locations (two were mixed long leaf/loblolly pine stands being managed specifically for Louisiana pinesnake habitat, and one was a loblolly pine plantation managed for fiber tree production), Reichling *et al.* (2008, p. 4) found the same number of Louisiana pinesnakes in the pine plantation (n=2) as one of the mixed pine stands managed for Louisiana pinesnake (n=2); however, of all the three trapping locations studied, the greatest number of snakes was found in the second mixed pine stand managed for Louisiana pinesnake (n=8). In addition, the snakes found in pine plantation conditions by Reichling *et al.* appeared thin or emaciated (indicating they probably had not fed recently), and were not recaptured in that habitat, which may have indicated they were moving through these sites (Reichling *et al.* 2008, pp. 9, 14). Further trapping at the same sites since the study has produced 17 and 9 more Louisiana pinesnakes for the first and second beneficially managed stands, respectively, and only 3 more for the plantation site (Pierce 2015, unpub. data).

Life History

Louisiana pinesnakes appear to be most active March through May and September through November (especially November), and least active December through February and during the summer (especially August) (Himes 1998, p. 12). During the winter, Louisiana pinesnakes use Baird's pocket gopher burrows as hibernacula (Rudolph *et al.* 2007 p. 561; Pierce *et al.* 2014, p. 140). In a study conducted by Pierce *et al.* (2014, pp. 140, 142), the species did not use burrows communally, and they did not exhibit fidelity to hibernacula sites in successive years. Louisiana pinesnakes observed in east

Texas appear to be semi-fossorial and essentially diurnal, and were also relatively immobile (i.e., moved less than 33 ft (10 meters (m)) on 54.5 percent of days monitored (Ealy *et al.* 2004, p. 391). In one study, they spent, on average, 59 percent of daylight hours (sunrise to sunset) below ground, and moved an average of 541 ft (163 m) per day (Ealy *et al.* 2004, p. 390). Adult males in a Louisiana study by Himes *et al.* moved an average of 495 ft (150 m) daily (longest = 3,802 ft (1,159 m)), adult females 348 ft (106 m), and juveniles 112 ft (34 m) (Himes 1998, p. 18). Himes *et al.* (2006, p. 107) documented an average home range size of 82 ac (33.2 ha) (range 16 to 267 ac (6.5 to 108 ha)) for the Louisiana pinesnake. Himes *et al.* also found that adult males had larger average home ranges (145 acres (ac) (58.7 hectares (ha))) than females (25 ac (14 ha)) and juveniles (13 ac (5.5 ha)) (Himes 1998, p. 18).

Baird's pocket gopher is the primary prey of the Louisiana pinesnake (Rudolph *et al.* 2002, p. 58), comprising an estimated 53 percent of available individual prey records (75 percent of total prey biomass) (Rudolph *et al.* 2012, p. 243). The Louisiana pinesnake exhibits specialized prey handling behavior for the burrow-dwelling pocket gopher not common among constricting snake species (Rudolph *et al.* 2002, pp. 59-61). The Louisiana pinesnake is also known to eat eastern moles (*Scalopus aquaticus*), cotton rats (*Sigmodon hispidus*), deer mice (*Peromyscus* sp.), harvest mice (*Reithrodontomys* sp.), and turtle (probably *Trachemys scripta*) eggs (Rudolph *et al.* 2002, p. 59; Rudolph *et al.* 2012, p. 244).

Louisiana pinesnake sexual maturity is attained at an approximate length of 4 ft (120 cm) and an age of approximately 3 years (Himes *et al.* 2002, p. 686). The Louisiana pinesnake is an egg-layer (oviparous), with a gestation period of about 21 days (Reichling

1988, p. 77), followed by 60 days of incubation. Having the smallest clutch size (three to five) of any North American colubrid snake, the Louisiana pinesnake exhibits a remarkably low reproductive rate (Reichling 1990, p. 221). However, the Louisiana pinesnake produces the largest eggs (generally 12 cm (5 in) long and 5 cm (2 in) wide) of any U.S. snake (Reichling 1990, p. 221). It also produces the largest hatchlings reported for any North American snake, ranging 18 to 22 in (45 to 55 cm) in length, and up to 3.77 ounces (oz) (107 grams (g)) in weight (Reichling 1990, p. 221). No Louisiana pinesnake nests have been located in the wild. Captive Louisiana pinesnakes can live over 30 years, but females have not reproduced beyond the age of 18 years (Reichling and Schad 2010, p. 5).

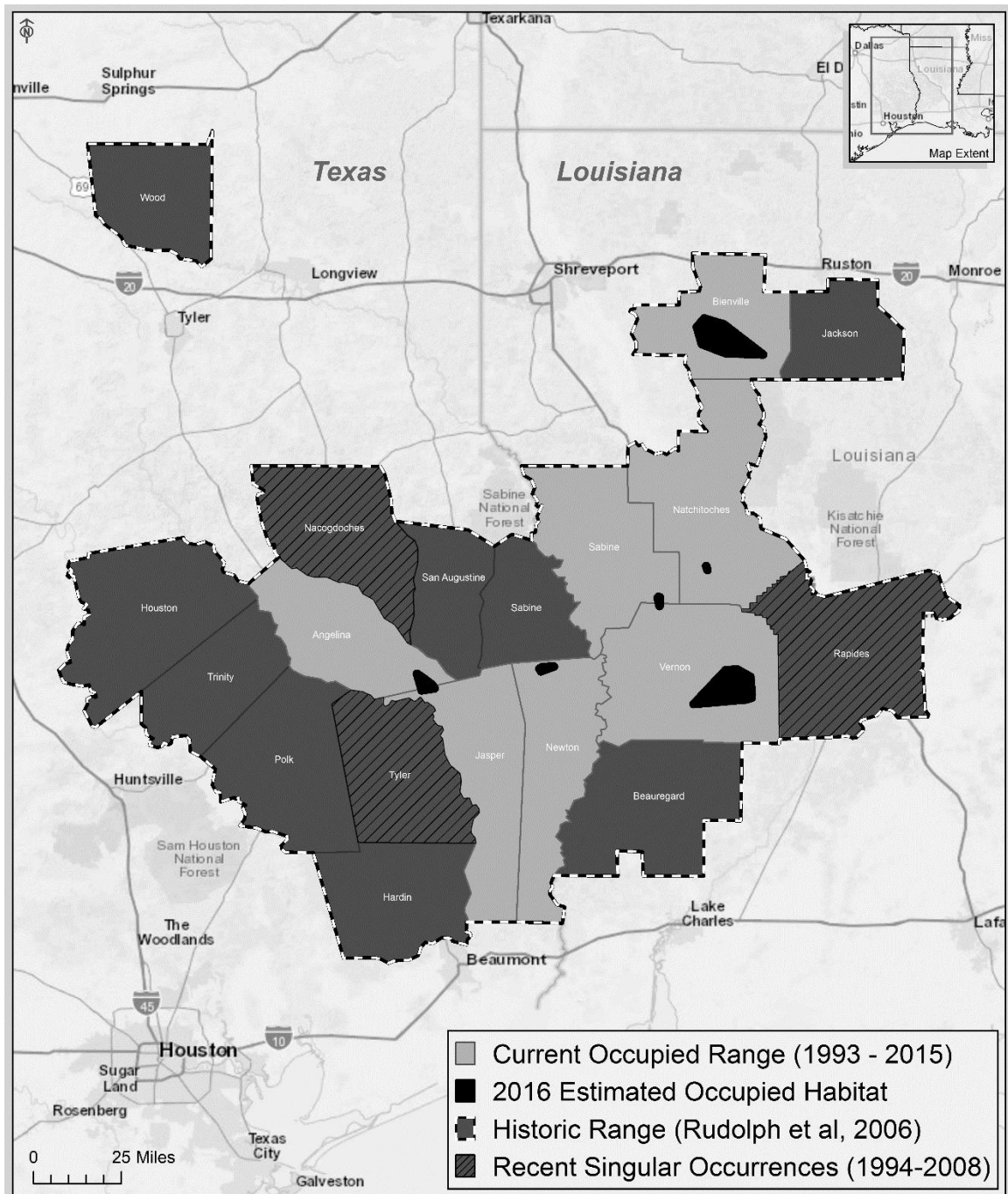
Historical and Current Distribution

The Louisiana pinesnake historically occurred in portions of northwest and west-central Louisiana and extreme east-central Texas (Conant 1956, p. 19). This area coincides with an isolated, and the most westerly, occurrence of the longleaf pine ecosystem and is situated west of the Mississippi River. Most of the sandy, longleaf pine-dominated savannahs historically inhabited by the Louisiana pinesnake had been lost by the mid-1930s (Bridges and Orzell 1989, p. 246; Frost 1993, p. 30). After virgin longleaf pine was cut, it rarely regenerated naturally. In some parts of the Southeast, free-ranging hogs depredated the longleaf pine seedlings, and fire suppression allowed shrubs, hardwoods, and loblolly pine to dominate (Frost 1993, pp. 34-36). The naturally maintained open structure and abundant herbaceous vegetation characteristic of the historical longleaf pine forests was diminished or lost, and, therefore, it is likely that undocumented populations of this species historically occurred but were lost before 1930.

The U.S. Forest Service (USFS), Southern Research Station (SRS), Wildlife Habitat and Silviculture Laboratory in Nacogdoches, Texas, has compiled and maintains a historical records database of all known Louisiana pinesnake locations (excluding telemetry data). According to that database, 267 occurrence records of 235 individual Louisiana pinesnakes have been verified from 1927 through December 21, 2015 (excluding reintroductions), all from Louisiana and Texas (Pierce 2015, unpub. data). By comparison, for the Florida pinesnake (*Pituophis melanoleucus mugitus*), a species with a four State range (Ernst and Ernst 2003, p. 281), there are 874 records of occurrence through 2015 in the State of Florida alone (Enge 2016, pers. comm.). Similarly, there are approximately 395 total records of black pinesnakes (*Pituophis melanoleucus lodingi*) since 1932 (Hinderliter 2016, pers.comm.).

Based on the Louisiana pinesnake database, there are records from seven parishes in Louisiana (Beauregard, Bienville, Jackson, Natchitoches, Rapides, Sabine, and Vernon) and 11 counties in Texas (Angelina, Hardin, Jasper, Nacogdoches, Newton, Polk, Sabine, San Augustine, Trinity, Tyler, and Wood) (Figure 1). Previous Louisiana pinesnake reports that are not included in this database are: single records for Calcasieu and Jefferson Davis Parishes in Louisiana (Williams and Cordes 1996, p. 35), considered suspect (Pierce 2015, unpub. data; Thomas *et al.* 1976, pp. 253–254; Walls 2008, pers. comm.); a single record from Cherokee County, Texas, which was erroneous (Pierce 2009, pers. comm.); single records from Montgomery and Walker Counties in Texas reclassified as *Pituophis catenifer* (Pierce 2008, pers. comm.); two records from Rapides Parish, Louisiana, and one from Caldwell County, Texas, from the 1960s considered not verifiable (Reichling 2012, pers. comm.; Thomas *et al.* 1976, pp. 253–254).

Figure 1. Current and Historic Range of Louisiana Pinesnake



Despite being primarily diurnal, the Louisiana pinesnake's apparent rarity, secretive nature, and preference for occupying pocket gopher burrow systems has made it difficult to generate extensive natural history information (Ealy *et al.* 2004, pp. 383–384). Trapping results are functions of trap location selection, trap success, and true presence or absence; thus trapping data only approximate Louisiana pinesnake use of an area, but are the best available estimate. Currently trapping is the only standardized and most effective known method for surveying Louisiana pinesnakes. While it is the most effective, it is also expensive and labor intensive. Trapping for Louisiana pinesnakes involves the use of multiple sets of drift fences with box traps in an area either known to be inhabited by Louisiana pinesnakes or that appears to have suitable habitat. Box and funnel traps, with and without drift fences, are effective in catching snakes similar in size, and related to the Louisiana pinesnake, including the bullsnake (*Pituophis catenifer sayi*), black pinesnake, Florida pinesnake, and northern pinesnake (*Pituophis melanoleucus melanoleucus*) (Burgdorf *et al.* 2005, p. 424; Fitch 1951, p. 80; Yager *et al.* 2005, p. 24; Zappalorti 2016, p. 7; Enge 2016, pers. comm.).

Since 1993, extensive Louisiana pinesnake trapping has been conducted at first near recent recorded occurrences of the species that appeared to be in suitable habitat, and then more broadly, in other locations of varying habitat conditions within the snake's historical range (Rudolph *et al.* 2006, p. 464) by the USFS, the U.S. Army, the Memphis Zoo, and the Louisiana Department of Wildlife and Fisheries (LDWF). Trapping has been conducted to provide animals for telemetry studies, to determine the effects of vehicle-caused mortality, and for surveys to document presence of the species (Rudolph *et al.* 2015, p. 3). A variable number of traps are operated per year in 10 Texas counties

and seven Louisiana parishes (Rudolph *et al.* 2015, p. 3). Through the years, there have been slight modifications to some traps, but it is not considered to have had major impacts on trap success (Rudolph *et al.* 2015, p. 3). Additionally, over time, new traps may be added to locations thought to contain Louisiana pinesnakes because of the presence of suitable conditions, such as preferred soils (Melder 2015, p. 115; Wagner *et al.* 2014, p. 152).

In total, trapping during 1993–2015 from throughout the historical range of the Louisiana pinesnake has resulted in 101 unique individual captures. Supported by rangewide trapping results and the historical records database, Rudolph *et al.* (2006, p. 467-469) concluded that the failure to document existing Louisiana pinesnake populations at known historical localities, coupled with the degradation and fragmentation of habitat in those areas, indicates that the Louisiana pinesnake had been extirpated from significant portions of its historical range. Three parishes (Beauregard, Jackson, and Rapides) in Louisiana, and seven counties (Hardin, Nacogdoches, Polk, Sabine, San Augustine, Trinity, and Wood) in Texas, are now considered unoccupied by the Louisiana pinesnake. Rudolph *et al.* (2006, pp. 467-469) determined that six occupied areas were in existence in 2006. In 2007, an area on the Kisatchie District of the Kisatchie National Forest (KNF) in Louisiana was determined to be occupied by the Louisiana pinesnake. Based on 2014 analysis (and reaffirmed by 2016 analysis) of occurrence records of counties or parishes with multiple observations since 1993, six natural, potentially extant, populations of Louisiana pinesnakes occur in four parishes (Bienville, Natchitoches, Sabine, and Vernon) in Louisiana, and three counties (Angelina, Jasper, and Newton) in Texas. Louisiana pinesnake habitat currently considered

occupied (based upon 1993–2015 occurrence data) is primarily concentrated on public lands controlled by the Department of Defense (DOD) (Joint Readiness Training Center and Fort Polk [Fort Polk] and Peason Ridge), the USFS (KNF and Angelina National Forest [ANF]), and privately owned industrial timberlands in Louisiana and Texas. There is also a reintroduction feasibility-study population of Louisiana pinesnakes that has been established from captive-bred snakes in Grant Parish, Louisiana, on KNF lands.

Although single observations were not used to establish known occupied areas, single individuals have been documented in one Louisiana parish and two Texas counties (see Figure 1, above). A single Louisiana pinesnake was observed crossing a road in 1994 in Tyler County, but no others have been recorded in that county in the 22 years since that observation. A single observation of a Louisiana pinesnake found dead along a road in 2001 indicates that the current population in Natchitoches Parish may have extended into extreme northwestern Rapides Parish, Louisiana; however, no more have been sighted in Rapides Parish since 2001. A juvenile Louisiana pinesnake was captured in 2008, in Nacogdoches County near Garrison, Texas (Pierce 2015, unpub. data), suggesting that at least some individuals existed near that site as recently as 8 years ago.

To estimate the size of occupied habitat areas, all Louisiana pinesnake records from 1993 to 2015 (Pierce 2015, unpub. data) containing location data and meeting the criteria established below (157 records), were plotted in a Geographic Information System (GIS). Using ArcMap (Version 10.2.1), a minimum convex polygon (MCP) was drawn around clusters of records, and a 0.6-mile (mi) (1.0-kilometer (km)) buffer was drawn around each MCP, resulting in the estimated occupied habitat area (EOHA) for Louisiana pinesnakes represented by that group of records. The MCP was buffered to

accommodate the fact that trap locations were not placed on the landscape with the intent of delineating population boundaries. A 0.6-mi (1.0-km) buffer was used because telemetry data indicate this is a reasonable approximation of the area that a Louisiana pinesnake uses during 1 or more years (Rudolph 2008a, pers. comm.). After discussions with experts, including Dr. Craig Rudolph and members of the Association of Zoos and Aquariums (AZA), the Service developed criteria to determine the data and methodology to be used for estimating the boundaries of the EOHAs.

All Louisiana pinesnake verified occurrence records were used for EOHA analysis except for: Those obtained prior to 1993 (before extensive trapping began); and records older than 11 years (from the time of analysis; which is the estimated Louisiana pinesnake generational turnover period (Marti 2014, pers. comm.)), when traps within 0.6 mi (1 km) of those records had been unproductive for 5 years of trap effort following the date of the records.

That methodology uses records (including non-trap occurrence) obtained over a period of intense surveys during the estimated generational time of Louisiana pinesnakes in captivity. However, some records that are located in areas potentially still occupied by the species, where habitat attributes have remained similar or improved since observed occurrence, are not used for this estimation of occupied range because significant trapping efforts have not produced any additional records in that area.

The original purpose of the EOHAs designation was to match proactive habitat management activities to areas most likely to be currently occupied by the Louisiana pinesnake (U.S. Fish and Wildlife Service 2014, p. 8). Based on the previously described methodology, the following EOHAs have been delineated (Figure 2): (1) The Bienville

EOHA located on privately owned industrial timberlands in Bienville Parish, Louisiana; (2) the Kisatchie EOHA located on USFS lands (the Kisatchie Ranger District of the KNF in Natchitoches Parish, Louisiana); (3) the Peason Ridge EOHA located on DOD lands (Vernon and Sabine Parishes) and a small amount of private lands (inholdings) in Louisiana; (4) the Fort Polk/Vernon EOHA located on DOD lands (Fort Polk), USFS lands (the Vernon Unit/Calcasieu District of the KNF), and a small amount of private lands (inholdings) in Vernon Parish, Louisiana; (5) the Scrappin' Valley EOHA located primarily on privately owned timberlands in Newton County, Texas; (6) the Angelina EOHA located on USFS lands (the southern section of ANF in Angelina and Jasper Counties) and private lands in Texas; and (7) the Catahoula Reintroduction Feasibility EOHA located on USFS lands (the Catahoula Ranger District of the KNF in Grant Parish, Louisiana). Utilizing the methods described above, the Winn Ranger District of the KNF in Natchitoches Parish, Louisiana, and the Sabine National Forest in Sabine County, Texas, identified in 2008, are no longer considered occupied.

24

Table 1. Land Ownership in acres (hectares) of estimated Louisiana pinesnake occupied habitat areas as determined for 2016 according to location records through 2015. Totals may not sum to rounding.

State	Estimated Occupied Habitat Area	U. S. Forest Service	Department of Defense	State and Municipal	Private	Total for Estimated Occupied Habitat Area
Louisiana	Bienville	0 (0)	0 (0)	363.7 (147.2)	60,727.2 (24,575.5)	61,090.9 (24,722.6)
	Kisatchie	1,598.8 (647.0)	0 (0)	0 (0)	0 (0)	1,598.8 (647.0)
	Peason Ridge	0 (0)	3,147.3 (1,273.7)	0 (0)	0 (0)	3,147.3 (1,273.7)
	Fort Polk/Vernon	34,164.7 (13,826.0)	27,601.3 (11,169.8)	0 (0)	222.6 (90.1)	61,988.7 (25,085.9)
	Catahoula Reintroduction	1,828.5 (739.9)	0 (0)	0 (0)	0 (0)	1,828.5 (739.9)
Louisiana Total		37,592.0 (15,213.0)	30,748.5 (12,443.5)	363.7 (147.2)	60,949.9 (24,665.6)	129,654.1 (52,469.2)
Texas	Scrappin' Valley	0 (0)	0 (0)	21.3 (8.6)	5,036.5 (2,038.2)	5,057.8 (2,046.8)
	Angelina	9,509.3 (3,848.3)	3.3 (1.4)	114.7 (46.4)	1,338.6 (541.7)	10,965.8 (4,437.7)
Texas Total		9,509.3 (3,848.3)	3.3 (1.4)	136.0 (55.1)	6,375.0 (2,579.9)	16,023.6 (6,484.5)
Total Ownership		47,101.3 (19,061.3)	30,751.9 (12,444.8)	499.7 (202.2)	67,324.9 (27,245.4)	145,677.7 (58,953.7)

Population Estimates and Status

The Louisiana pinesnake is recognized as one of the rarest snakes in North America (Young and Vandeventer 1988, p. 203; Himes *et al.* 2006, p. 114). It was classified in 2007 as endangered on the International Union for Conservation of Nature's (IUCN's) Red List of Threatened Species (version 3.1; <http://www.iucnredlist.org/>).

Most Louisiana pinesnake records that were used to approximately delineate occupied habitat for 2016 were acquired by trapping. We considered each day that a trap was open a "trap day." Thus, for an area being surveyed, all traps in that area that were open contribute to the number of trap days (i.e., four traps that are open for 3 days each equals 12 trap days). The ratio of trap days and number of unique snakes captured is called "trap success" (i.e., two unique snakes captured during 2,000 trap days = 1 capture per 1,000 trap days or a 1:1,000 trap success) and was determined for each population. Louisiana pinesnake trapping across the species' entire range (including areas outside of EOHAs in Louisiana and Texas) during 1993 through 2015 has resulted in 101 unique individual captures during 448,892 trap days (1:4,444 trap success) (Pierce 2016a, pers. comm.). Trapping information can be compared to similar species to get a sense of the relative rarity of this species when compared to a similar species trapped in a comparable way. For instance, a Florida pinesnake trapping effort using similar drift fence trapping methods in one 30,000-ac (12,141-ha) section of the species' range captured 87 unique individuals during 50,960 trap days (1:585.7 trap success) over a 13-year period from 2003 to 2015 (Smith 2016b, pers. comm.). The Louisiana pinesnake site with the greatest long-term trap success by far, the Bienville EOHA, which is 61,090.9 ac (24,722.6 ha), has a trap success rate of 1:854.0 between 1993 and 2015 (Pierce 2016a, pers. comm.),

which is substantially lower than those found in Smith's study of Florida pinesnake. Actual population densities cannot be reliably estimated from trapping data because mark-recapture analyses cannot be conducted without sufficient numbers of Louisiana pinesnake recaptures, but similar trapping methods have been used by others to estimate snake abundance.

All Louisiana pinesnake EOHAs contain at least some suitable habitat, and experience varying amounts of beneficial forest management. However, most populations appear to show either a decline or no conclusive change in trap success through time, indicating that numbers of individuals in most populations are likely decreasing (Rudolph *et al.* 2015, p. 8). Despite continued effort, some populations have not experienced trap success or other occurrence records for many years. For this reason, as discussed earlier, the Winn Ranger District of the KNF portion of the Bienville EOHA and the Sabine EOHA are no longer considered occupied. Trapping efforts (all provided by Pierce (2015, unpub. data)) and habitat management actions are presented below for each EOHA.

Bienville EOHA

Based on trap and other occurrence records (84 occurrences (including trap recaptures) from 1988 through 2015) (Pierce 2015, unpub. data), the Bienville population is widely believed to be the largest extant Louisiana pinesnake population (Rudolph *et al.* 2006, p. 465; Reichling *et al.* 2008, p. 10). For all trapping efforts so far (1995 through 2015, not continuous), trap success for this population was 1:854. While trap success varies annually, the trap success in this area has been consistently greater than for any other population overall. Trapping on that private timberland has only recently resumed

in 2012, after cessation in 2009. The Kepler Lake area of the Bienville EOHA has produced the best trap success of any trapping area in areas currently known to be inhabited by the species. Consequently, Reichling *et al.* (2008, p. 10) believed this site was critical for the preservation of this species. Trapping from a previous effort on the Winn District portion of this population between 2000 and 2001 provided two captures (in addition to one recapture). Trap efforts in the same area from 2004 to 2013 have produced zero captures in 7,525 trap days, and the area is now regarded as unoccupied.

Within the privately owned timberland described above, two disjunct areas are managed for the Louisiana pinesnake with thinning, longleaf pine restoration, targeted herbicide use, and prescribed burning (see “Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range,” below).

Kisatchie EOHA

Two relatively recent Louisiana pinesnake occurrence records (one non-capture sighting (2003) and one hand-capture (2007)) exist for this population. No Louisiana pinesnakes were captured during 12,011 trap days (1997 to 2003) on the Kisatchie District of the KNF. However, past trapping did not occur in the locations of the records mentioned above. Furthermore, despite the presence of substantial amounts of suitable habitat on the Kisatchie District, past trapping did not sample the best habitat (Rudolph *et al.* 2006, p. 469). Trapping resumed within this population in 2012, in the best habitat, and has continued through 2015, but no captures (by hand or trap) have occurred since the 2007 capture (Pierce 2015, unpub. data).

Active habitat management for the endangered red-cockaded woodpecker (*Picoides borealis*) and the Louisiana pinesnake occur within and surrounding the EOHA

of this population (see “Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range,” below).

Peason Ridge EOHA

Six occurrence records (from 2003 to 2013, all observed after 2005) exist for this population; one of which was a non-trap sighting. The trapping effort for the last 5 years (2009 to 2013 (8,446 trap days)) produced four captures, one in 2010, two in 2012, and one in 2013, with a success rate of 1:2,112 (Pierce 2015, unpub. data).

Active habitat management for the red-cockaded woodpecker and the Louisiana pinesnake occurring at this site has stabilized or increased the amount of preferable habitat that exhibits suitable vegetative characteristics (see “Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range,” below).

Fort Polk/Vernon EOHA

Twenty-two occurrence records from 2003 to 2013, including four non-trap sightings and four trap-recaptures, exist for this population. Trap success for this population over 5 years (2009 to 2013) is estimated to be 1:2,625 (eight unique individual captures out of 21,003 trap days), which includes all recent unsuccessful surveying on the Vernon Unit of the KNF. Since 2003, no captures have occurred on the Vernon Unit. Excluding trapping on the Vernon Unit, DOD observed a trap success rate over 5 years (2009 to 2013) of 1:1,959 (eight unique individual captures during 15,672 trap days) on DOD property (Pierce 2015, unpub. data). Two snakes were trapped in 2014, and there were three records of occurrence in 2015 (one hand-captured and two dead on roads).

Active habitat management for the red-cockaded woodpecker and the Louisiana pinesnake has stabilized or increased the amount of habitat that has suitable vegetative

characteristics (see “Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range,” below).

Scrappin’ Valley EOHA

On this primarily private land, five occurrence records during 2005 to 2015 exist for this population; however, two of those were road mortalities, two were removed from the wild for captive breeding, and one was sighted but not captured. There have been no trap captures since 2009 during 15,628 trap days within this population and no other occurrences. During trapping efforts on this land from 1995 to 1997, five captures occurred during 2,128 trap days (a success rate of 1:426), demonstrating a reduction of trap success at this site (Pierce 2015, unpub. data).

Active habitat management for the red-cockaded woodpecker and the Louisiana pinesnake occurs at this site (see “Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range,” below).

Despite Louisiana pinesnake occurrences as recent as 2008, and proactive habitat management by the former and current private landowners, the lack of recent trap success when compared to trap success in the 1990s suggests that this population has declined due to prolonged minimal suitable habitat availability.

Angelina EOHA

Seven occurrence records during 2003 to 2013 exist for this population. Four were unique trap captures, one was a trap recapture, one was hand-caught alive on a road, and one previously captured and pit-tagged individual was found dead on a road in 2009. Both the trap recapture and hand-caught individual were removed from the wild for captive breeding. From 2009 to 2013, no unique trap captures have occurred within this

population during 16,277 trap days. The most recent unique individual trap capture at this site was in 2007. However, a recapture did occur within this population as recently as 2012, and that individual was removed from the wild for captive breeding. Trap success rates have shown a steady decline throughout the effort period: From 1992 to 1997, success rate was 1:652 (2 captures during 1,303 trap days); during 1998 to 2005, success rate was 1:3,420 (2 captures during 6,840 trap days); and during 2007 to 2012, success rate was 1:5,305 (3 captures during 15,916 trap days). However, all trap effort within this population produced only a total of seven unique individual Louisiana pinesnakes since the 1990s (27,656 trap days) (Pierce 2015, unpub. data).

Active habitat management for the red-cockaded woodpecker and the Louisiana pinesnake occurs at this site (see “Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range,” below).

Catahoula Reintroduction Feasibility EOHA

An informal committee was established to oversee and conduct an experimental reintroduction of the Louisiana pinesnake in an attempt to demonstrate the feasibility of reintroducing a population using individuals from a captive population, and establishment of a viable population in restored habitat. In total, 77 captive-bred Louisiana pinesnakes (11 in 2010, 15 in 2011, 3 in 2012, 15 in 2013, 1 in 2014, 15 in 2015, and 17 in 2016) have been released into the wild at the Catahoula Ranger District of the KNF (Pierce 2016, unpub. data; Pierce 2016b, pers. comm.; Smith 2016a, pers. comm.). This area is not near any known Louisiana pinesnake populations and not within the known historical range of the species. Detection of released snakes is occurring within this EOHA through monitoring of deployed Automated PIT Tag Recorders (APTRs) and trapping. Prior to

March 22, 2016, 60 snakes have been released, and as of that date a total of 26 individual snakes have been detected at least once after release (detections beginning 1 day after release): of those, 14 snakes have been detected alive more than 60 days after release, of those, 10 have been detected alive in the year following the winter after release, of those, 7 have been detected 2 years (winters) after release, of those, 3 have been detected 3 years (winters) after release, and of those, 1 snake has been detected 4 years (winters) after release (Pierce 2016b, pers. comm.; Pierce 2016c, pers. comm.).

Active habitat management for the red-cockaded woodpecker and the Louisiana pinesnake occurs at the Catahoula Ranger District site (see “Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range,” below).

Captive-breeding Population

The captive Louisiana pinesnake zoo population established in 1984 was initially maintained through wild collection. The AZA Species Survival Plan (SSP) for the Louisiana pinesnake was implemented in 2000, to manage the zoo population (Reichling *et al.*, *in litt.* 2015, p. 1). The goals of the SSP are to: Maintain an assurance colony for wild Louisiana pinesnake populations, preserve or increase genetic heterozygosity into the future, preserve representative genetic integrity of wild populations, and provide individuals as needed for research and repopulation for the conservation of wild populations (U.S. Fish and Wildlife Service 2013, pp. 32-33). As of March 2016, the captive-breeding Louisiana pinesnake population consists of 111 individuals (51 males, 53 females, and 7 unsexed individuals) in 18 AZA accredited institutions and 2 non-AZA partner institutions (Reichling 2016, pers. comm.). Initially, three populations were managed based on their different geographic origins, which are separated by rivers (one

from Texas, separated from Louisiana by the Sabine River, and two from Louisiana, which are separated by the Red River) (Reichling and Schad 2010, p. 1). Recent genetic analyses showed that all populations were similar in population structure and the Texas and southern Louisiana populations were difficult to separate genetically (Kwiatkowski *et al.* 2014, p. 12). Therefore, currently one group is derived from Bienville Parish, Louisiana, founders and the other group is a combination of Vernon Parish, Louisiana, and eastern Texas snakes (Reichling 2016, pers. comm.).

Summary of Factors Affecting the Species

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above threat factors, singly or in combination. In this section, we summarize the biological condition of the species and its resources, and the influences of the listing factors on them, to assess the species' overall viability and the risks to that viability.

Factor A: The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range.

Both the quantity and quality of the natural longleaf pine ecosystem, the primary historical habitat of the Louisiana pinesnake, have declined sharply in Louisiana and

Texas since European settlement. The loss, degradation, and fragmentation of the longleaf pine dominant ecosystem was historically caused by logging, turpentine, fire suppression, alteration of fire seasonality and periodicity, conversion to generally off-site pine species plantations, agriculture, and free-range hogs (Frost 1993, pp. 24-30, 31, 35). Virtually all virgin timber in the southern United States was cut during intensive logging from 1870 to 1920 (Frost 1993, p. 30). Only about 2.9 percent of longleaf pine forests in Louisiana and Texas were uncut old-growth stands in 1935 (Bridges and Orzell 1989, p. 246). During the latter half of the 20th century, Louisiana, Alabama, and Mississippi lost between 60 and 90 percent of their already reduced longleaf acreage (Outcalt and Sheffield 1996, pp. 1-10). By the late 1980s, the natural longleaf pine acreage in Louisiana and Texas was only about 15 and 8 percent, respectively, of what had existed in 1935 (Bridges and Orzell 1989, p. 246). Those longleaf pine forests were primarily converted to extensive monoculture pine plantations (Bridges and Orzell 1989, p. 246), which presumably were not primarily managed for enhancement of herbaceous vegetation.

In short, the longleaf dominant pine forest (longleaf pine forest type plus longleaf pine in mixed species stands) in the southeastern United States declined approximately 96 percent from the historical estimate of 92 million ac (37 million ha) (Frost 1993, p. 20) to approximately 3.75 million ac (1.52 million ha) in 1990 (Guldin *et al.* 2016, p. 324). Since the 1990s, longleaf pine dominant forest acreage has been trending upward in parts of the Southeast through restoration efforts (Guldin *et al.* 2016, pp. 323-324). By 2010, the longleaf dominant pine forest stands had increased to approximately 4.3 million ac (1.7 million ha) (Oswalt *et al.* 2012, p. 10; Guldin *et al.* 2016, pp. 323-324). A recent

estimate for the extent of longleaf dominant pine forest in 2015 was 4.7 million ac (2.8 million ha) (America's Longleaf Restoration Initiative 2016, p. 12).

In general, southern forest futures models predict declines of overall forest land area in the southeastern United States between 2 and 10 percent in the next 50 years (Wear and Greis 2013, p. 78). The model-projected losses of natural pine forest in the Southeast would be mostly the result of conversion to planted pine forests (Wear and Greis 2013, p. 79). For the southern Gulf region, model runs assuming high levels of urbanization and high timber prices predict large percentage losses in longleaf pine in some parishes and counties of Louisiana and Texas that were historically and that are currently occupied by the Louisiana pinesnake, while two Louisiana parishes in the current occupied range are expected to gain (less than the percent decline predicted in the other parishes and counties) in longleaf pine acreage (Klepzig *et al.* 2014, p. 53). The outer boundary or "footprint" of the longleaf pine ecosystem across its historical range has contracted as recently as the period of 1990 to 2010, with losses (primarily due to conversion to loblolly pine) in western Louisiana and eastern Texas (Oswalt *et al.* 2012, pp. 10-14).

Impacts from urbanization are not consistent throughout the Southeast, and most population growth is predicted to occur near major cities (Wear and Greis 2013, p. 21), which are generally not near known Louisiana pinesnake occurrences; however, the most recent assessment still predicts decreased use of land for forests (mainly due to urbanization) in the next 45 years in all of the parishes (Louisiana) and counties (Texas) historically and currently occupied by the species (Klepzig *et al.* 2014, pp. 21-23).

High-quality longleaf pine forest habitat, which is generally characterized by a high, open canopy and shallow litter and duff layers, is maintained by frequent, low-intensity fires, which in turn restrict a woody midstory and promote the flowering and seed production of fire-stimulated groundcover plants (Oswalt *et al.* 2012, pp. 2-3). The Louisiana pinesnake was historically associated with natural longleaf pine forests, which were maintained in good condition by natural processes and have the abundant herbaceous vegetation necessary to support the Louisiana pinesnake's primary prey, the Baird's pocket gopher (Himes 1998, p. 43; Sulentic *et al.* 1991, p. 3; Rudolph and Burgdorf 1997, p. 17). Based on trapping surveys and location records, it appears that areas managed with silvicultural practices for fiber production that do not allow sufficient herbaceous vegetation growth do not support viable Louisiana pinesnake populations (Rudolph *et al.* 2006, p. 470) because the snake's pocket gopher prey requires herbaceous vegetation for forage.

Rudolph *et al.* (2006, p. 467) assessed habitat conditions during 1999 and 2000, at the locations of all historical Louisiana pinesnake records ($n = 118$ localities) known at that time. They found that 70 percent (26 of 37) of the localities on public lands met their criteria as excellent or good condition, whereas only 33 percent (27 of 81) of the localities on private lands met their criteria as excellent or good condition. Due to habitat fragmentation, most sites with excellent or good habitat were isolated and small (typically a few hundred hectares, or less (Rudolph *et al.* 2006, p. 466)). The distribution of Louisiana pinesnakes within the current range was further restricted because intensive land use activities and the disruption of natural fire regimes had decreased the quantity and quality of the intervening areas as habitat for this species (Rudolph *et al.* 2006, p.

470). Based on the low capture rates reported during trapping from 1993 to 2001, and the limited habitat availability, Rudolph *et al.* (2006, p. 468) concluded that remnant Louisiana pinesnake populations are not large. In fact, during this 9-year trapping period, only 24 unique captures of Louisiana pinesnakes occurred out of 2,372 total unique snake captures in 101,828 trap days (a trap success of 1:3,775 for Louisiana pinesnake). At many sites, no pinesnakes were captured, but even at sites where they were captured, the average trap success was only 1:733 (Rudolph *et al.* 2006, p. 465).

The disruption of natural fire regimes, due to fire suppression and inadequate, infrequent prescribed burning, is the leading factor responsible for the degradation of the small amount of remaining suitable longleaf pine forest habitat (Rudolph and Burgdorf 1997, p. 118; Rudolph 2000, p. 7). In the absence of frequent and effective fires, upland pine savannah ecosystems rapidly develop a midstory of hardwoods and other overstory species that suppress or eliminate any herbaceous understory. As the presence of pocket gophers is directly related to the extent of herbaceous vegetation available to them, their population numbers and distribution decline as such vegetation declines, which in turn directly impacts the number and distribution of Louisiana pinesnakes. The use of prescribed burning has decreased on private timberlands because of legal liability and the expense of liability insurance, the planting of pine species which have a reduced tolerance to fire, limited funds and personnel, and smoke management issues. According to Wear and Greis (2013, p. 509), southern forests are likely to see increasing challenges to prescribed burning in the future as land-use changes involving fuels management, increased urban interface, and revised safety and health regulations will continue to constrain prescribed fire efforts. Some of these constraints could be in the form of

reduced fire intervals or reductions in average area burned per fire event (strategies often used in management of pine plantations), which may not provide adequate fire intensity or frequency to suppress the overgrown understory and midstory conditions that limit herbaceous vegetation growth.

Overstory species other than longleaf pine can be managed to provide suitable understory for pocket gophers, but this is generally more difficult, as these species lack the physical characteristics and ecological adaptations to sustain desired understory conditions during all life stages, especially when managed with prescribed fire. Specifically, longleaf pine is adapted to thrive with frequent fire during all life stages, which allows continual maintenance of herbaceous communities. Other pine species lack these adaptations to fire that allow for frequent fire during all life stages (especially very young trees). Non-longleaf pine communities can be managed to provide suitable habitat within a stand when burning is not recommended (e.g., very young trees) by using herbicides and other techniques. However, if those techniques alter the composition or density of the groundcover vegetation and pocket gophers decline in response, it is likely that Louisiana pinesnakes will decline in response as well (USFWS 2001). In addition, longleaf pine structure (e.g., branch and needle structure) naturally allows more sunlight penetration at similar stem densities than other pine species.

Regardless of the methods used to promote herbaceous vegetation in the understory, the amount and types of herbaceous vegetation are limited by the amount of sunlight able to reach the forest floor and, for some species, by the presence of fire (i.e., to scarify seeds, promote seed production, and consume leaf litter). Therefore, conversion and management of overstory vegetation that does not provide for continued

maintenance of herbaceous vegetation in otherwise suitable habitat will further limit habitat available to the Louisiana pinesnake.

Habitat fragmentation threatens the continued existence of all Louisiana pinesnake populations, particularly those on private lands. This is frequently the result of urban development, conversion of longleaf pine sites to intensively managed pine plantations, and an increase in the number of roads. When patches of available habitat become separated beyond the dispersal range of a species, small populations may become less resilient because additions of individuals to the population may decline along with their potential genetic diversity contributions, thus increasing the risk of extirpation (see discussion under *Factor E: Other Natural or Manmade Factors Affecting Its Continued Existence*).

In summary, habitat loss and continuing degradation of the Louisiana pinesnake's habitat remain a significant threat to this species' continued existence.

Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range

When considering whether or not to list a species under the Act, we must identify existing conservation efforts and their effect on the species. In this section, we describe the extensive habitat restoration efforts that have occurred on Federal lands throughout the range (to a lesser extent on private lands) that have reduced the threat of habitat loss for some populations. We also discuss the lack of a definitive positive response of the Louisiana pinesnake to these efforts, at present.

Existing and Planned Conservation Efforts: As early as the 1980s, forest restoration and management had been implemented on Fort Polk, Peason Ridge, and

adjacent USFS lands to restore and maintain conditions of widely spaced trees, clear of dense midstory growth (U.S. Department of the Army 2014, p. 21). Management occurred for training suitability and red-cockaded woodpecker habitat, and most recently for Louisiana pinesnake habitat. The requirements for those three objectives happen to have significant overlap, especially the maintenance of open canopy pine forest.

USFS has also implemented habitat restoration and management for many years on Sabine National Forest (SNF), ANF, and KNF to benefit the red-cockaded woodpecker, as provided for in its land and resource management plans (USFS 1996, pp. 107-134; USFS 1999, pp. 2-61 to 2-73). In 2003, a candidate conservation agreement (CCA) for the Louisiana pinesnake, which includes the Service, USFS, DOD, Texas Parks and Wildlife Department (TPWD), and LDWF, was completed. Targeted conservation actions are currently being implemented as part of that agreement. The CCA is designed to identify and establish beneficial habitat management actions for the Louisiana pinesnake on Federal lands in Louisiana and Texas, and provides a means for the partnering agencies to work cooperatively on projects that avoid and minimize impacts to the species. The CCA also set up mechanisms to exchange information on successful management practices and coordinate research efforts. SNF [Sabine Louisiana pinesnake population considered extirpated since 2014] and ANF in Texas, and KNF and Fort Polk in Louisiana, agreed in the CCA to continue or start new stem thinning and prescribed burning operations in sections of upland pine forests and, where possible, to convert forests to longleaf pine (CCA 2003, p. 12-16).

Since completion of the CCA, beneficial forest management activities conducted by USFS and Fort Polk have been formally dedicated to conservation of the Louisiana

piresnake. Removing some trees from a dense stand with heavy canopy cover allows more light to reach the ground, which can promote the growth of herbaceous vegetation, an important food source for the primary prey of the Louisiana pinesnake. Prescribed burning helps to control midstory cover, particularly hardwood species that compete with pine seedlings and reduce light penetration. Converting forests to longleaf pine is helpful because longleaf pine is better adapted to fire (and tolerates it at an earlier age) than other pine species, and therefore is generally easier to manage with prescribed fire over multiple rotations. Historically, Louisiana pinesnakes were predominantly found in longleaf pine forests, and that forest type was historically the dominant type in the areas that now make up the KNF, ANF, and Fort Polk.

The CCA was revised in 2013, and now also includes the U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) and the AZA as cooperators (U.S. Fish and Wildlife Service 2013, pp. 7-8). That agreement updates, supersedes, and improves upon the 2003 CCA, and uses significant new information derived from research, threats assessments, and habitat modeling that was not available in 2003 to focus conservation actions, including beneficial forest management, in areas with the best potential to become suitable habitat for the Louisiana pinesnake. Those areas are called habitat management units (HMUs), and they were delineated based on existing red-cockaded woodpecker habitat management areas (HMAAs) in upland pine forests. Those areas were further defined by the location of preferable and suitable soils (LRSF-Model) for the Louisiana pinesnake in order to dedicate resources to areas the species is most likely to inhabit. However, the updated CCA addresses threats from habitat loss only on Federal lands, and for the activities performed by NRCS on private land. The

CCA also includes guidance on practices to reduce impacts to Louisiana pinesnakes from vehicles on improved roads and off-road all-terrain vehicle (ATV) trails (see “Conservation Efforts to Reduce Threats Under Factor E,” below).

Thousands of acres of forests on Federal lands have been treated over many years with prescribed burning, and that treatment along with tree thinning continues to the present. The following tables summarize recent forest management activities on Federal lands where Louisiana pinesnake populations occur. Values have been rounded to the nearest acre.

Table 2. Acres (hectares) of prescribed burning and thinning conducted in the Kisatchie Ranger District of the KNF (Kisatchie population) within the 2014 delineated EOHA (1,599 total ac [647 ha]) and the larger surrounding HMU (36,114 total ac [14,615 ha]).

Area	Prescribed Burning 2015	Prescribed Burning 2013–2015	Stocking Reduction (Thinning) 2015
EOHA	963 (390)	1,980 (801)	0 (0)
HMU	4,285 (1,734)	24,893 (10,074)	193 (78)

Table 3. Acres (ha) of prescribed burning and thinning conducted in the Vernon Unit of the KNF (Fort Polk/Vernon population) within the 2014 delineated EOHA (34,487 total acres [13,956 ha]) and the larger surrounding HMU (61,387 total acres [24,842 ha]).

Area	Prescribed Burning 2015	Prescribed Burning 2013–2015	Stocking Reduction (Thinning) 2015
EOHA	12,670 (5,127)	43,281 (17,515)	1,541 (624)

HMU	20,734 (8,391)	74,927 (30,322)	1,670 (676)
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Table 4. Acres (ha) of prescribed burning and thinning conducted at Fort Polk (Fort Polk/Vernon population) within the 2014 delineated EOHA (27,502 total acres [11,130 ha]) and the larger surrounding HMU (29,037 total acres [11,751 ha]).

Area	Prescribed Burning 2015	Prescribed Burning 2013–2015	Stocking Reduction (Thinning) 2015
EOHA	7,675 (3,106)	22,628 (9,157)	430 (174)
HMU	9,159 (3,707)	24,241 (9,810)	586 (237)

Table 5. Acres (hectares) of prescribed burning and thinning conducted at Peason Ridge (Peason Ridge population) within the 2014 delineated EOHA (4,886 total ac [1,977 ha]) and the larger surrounding HMU (11,265 total ac [4,559 ha]).

Area	Prescribed Burning 2015	Prescribed Burning 2013–2015	Stocking Reduction (Thinning) 2015
EOHA	489 (198)	2,597 (1,051)	0 (0)
HMU	2,651 (1,073)	7,440 (3,011)	100 (40)

Table 6. Acres (ha) of prescribed burning and thinning conducted in ANF (ANF population) within the 2014 delineated EOHA (10,966 total ac [4,438 ha]) and the larger surrounding HMU (24,200 total ac [9,793 ha]).

Area	Prescribed Burning 2015	Prescribed Burning 2013–2015	Stocking Reduction (Thinning) 2015

EOHA	2,735 (1,107)	10,179 (4,119)	0 (0)
HMU	6,702 (2,712)	18,940 (7,665)	0 (0)

Table 7. Acres (hectares) of prescribed burning and thinning conducted in the Catahoula Ranger District KNF (Catahoula Reintroduction Feasibility population) within the 2014 delineated EOHA (1,828 total ac [740 ha]) and the larger surrounding HMU (57,394 total ac [ha]).

Area	Prescribed Burning 2015	Prescribed Burning 2011–2015	Stocking Reduction (Thinning) 2015
EOHA	784 (317)	784 (317)	0 (0)
HMU	8,279 (3,350)	40,419 (16,357)	231 (93)

Within the Bienville EOHA, the 851-ac (344-ha) Kepler Lake and 859-ac (348-ha) Sandylands Core Management Areas (CMAs) (approximately 2.8 percent of the EOHA) were voluntarily established by the landowners at the time to be managed for Louisiana pinesnake habitat. According to the current landowner (Cook 2016a, 2016b, pers. comm.), in the loblolly-longleaf pine mixed stands of the Kepler Lake and Sandylands CMAs, approximately 50 percent (430 ac (174 ha)) and 55 percent (475 ac (192 ha)), respectively, have been planted with longleaf pine beginning in 2001. Using a combination of supplemental funding sources (e.g., Service Private Stewardship Grant, Western Gulf Coastal Plain Prescribed Burning Initiative), the present landowner has completed prescribed burning of hundreds of acres on the CMAs each year since 2000 (except in 2005, 2008, 2009, and 2012). Additionally, midstory (hardwood and shrub)

control is achieved in the CMAs by application of herbicide in narrow bands alongside the planted trees instead of broadcast spraying, which limits damage of herbaceous vegetation.

Most of the 59,380 acres (24,030 ha) of timberlands surrounding the CMAs of the Bienville population are managed with intensive silvicultural practices that typically preclude continual, robust herbaceous vegetation growth. Reichling *et al.* (2008, p. 10) did not believe that isolated management areas that were 800 to 1,000 ac (324 to 405 ha) or less in size were sufficient to support viable Louisiana pinesnake populations, and therefore concluded the snakes in the Kepler Lake CMA were likely dependent upon the surrounding habitat. Consequently, Reichling *et al.* (2008, p. 10) felt that it was essential to the conservation of the species to restore and preserve the thousands of hectares of privately owned, upland, xeric habitat that surround the Kepler Lake CMA.

The 5,057.8-ac (2,046.8-ha) Scrappin' Valley EOHA is located at least partially within 11,000 acres (4,452 ha) of privately owned forested land referred to as Scrappin' Valley. That area was managed for game animals for decades (Reid 2016, pers. comm.), and one section (approximately 600 ac (243 ha)) was managed specifically for quail. Prescribed burning was applied only to the 600-ac (243-ha) quail area annually and to another 1,500 ac (607 ha) at less frequent intervals. The remainder of the property was not beneficially managed for Louisiana pinesnake habitat. In 2012, the property was subdivided and sold as three separate properties of 1,900, 1,500, and 7,700 acres (769, 607, and 3,116 ha), respectively.

On the 1,900-ac (769-ha) property from 2013 to spring 2016, hundreds of acres (some acres burned multiple times) of longleaf dominated pine forest occupied by the

red-cockaded woodpecker or near red-cockaded woodpecker clusters were prescribed-burned each year; hardwood removal was conducted on 300 ac (121 ha); thinning by removal of loblolly and slash pine trees was conducted throughout the entire property; and 105 ac (42 ha) of longleaf pine restoration (removal of existing trees and planted with long leaf pine) was completed. The landowner is also currently working with The Nature Conservancy toward a perpetual conservation easement on 2,105 ac (852 ha) to protect habitat for the red-cockaded woodpecker and the Louisiana pinesnake.

On the 1,500-ac (607-ha) property in 2015, approximately 250 ac (101 ha) of loblolly pine with dense understory vegetation was harvested, and 200 ac (81 ha) of the area was planted with longleaf pine. The landowner voluntarily agreed to manage the area to promote longleaf pine forest over a 10-year period through a Partners for Fish and Wildlife Program agreement with the Service.

On the 7,700-ac (3,116-ha) property, most of the forest was not burned, so there is a dense midstory. Several hundred acres are comprised of young loblolly pine plantation. In 2014, approximately 400 ac (162 ha) were harvested, and in 2015, approximately 205 ac (83 ha) of longleaf pine were planted. The landowner voluntarily agreed to manage the area to promote longleaf pine forest over a 10-year period through a Partners for Fish and Wildlife Program agreement with the Service. Additionally, approximately 1,000 ac of this property are prescribed burned annually.

Overall, less than 50 percent of the Scrappin' Valley EOHA is being managed beneficially for the Louisiana pinesnake, but more than 50 percent of the area is covered under safe harbor agreements (SHAs) for the red-cockaded woodpecker, which require forest management that is generally beneficial to the Louisiana pinesnake.

Longleaf pine forest improvement and restoration efforts are also currently occurring within the historical range of the Louisiana pinesnake on smaller private properties, especially through programs administered by natural resource agencies such as NRCS, and nonprofit organizations such as The Nature Conservancy (TNC). NRCS has provided assistance with thousands of acres of forest thinning, longleaf pine planting, and prescribed burning (Chevallier 2016, pers.comm.). However, the extent of overlap of increases in longleaf pine acreage, due to this program, with occupied or potential Louisiana pinesnake habitat (i.e., preferable or suitable soils) is unknown because the specific locations of the projects within the area serviced are private and unavailable to the Service. TNC owns 1,551 ac (628 ha) of land within the Vernon Unit of KNF that is managed for the red-cockaded woodpecker and the Louisiana pinesnake (Jacob 2016, pers. comm.).

The Service and LDWF are currently developing a programmatic candidate conservation agreement with assurances (CCAA) for the Louisiana pinesnake. A CCAA is intended to facilitate the conservation of candidate species by giving non-Federal property owners (enrollees) incentives to implement conservation measures. The incentive to a property owner provided through a CCAA is that the Service will impose no further land-, water-, or resource-use restrictions beyond those agreed to in the CCAA should the species later become listed under the Act. If the species does become listed, the property owner is authorized to take the covered species as long as the level of take is consistent with the level identified and agreed upon in the CCAA. The CCAA policy considers that all CCAAs will provide benefits to covered species through

implementation of voluntary conservation measures that are agreed to and implemented by property owners.

The Louisiana pinesnake programmatic CCAA is intended to establish a framework for participation of the Service and LDWF, and enrollees, through specific actions for the protection, conservation, management, and improvement of the status of the Louisiana pinesnake. Initiation of this CCAA will further the conservation of the Louisiana pinesnake on private lands by protecting known populations and additional potential habitat by reducing threats to the species' habitat and survival, restoring degraded potential habitat on preferred and suitable soils, and potentially reintroducing captive-bred snakes to select areas of the restored habitat.

The CCAA is part of an application for an enhancement of survival permit (permit) under section 10(a)(1)(A) of the Act. The permit, which will be held by LDWF, will authorize take of the Louisiana pinesnake during the period of the CCAA. The permitted take will be that resulting from activities covered in the CCAA and the individual cooperative management agreements between LDWF and enrollees in Louisiana who are willing to engage in voluntary conservation actions for the Louisiana pinesnake. Take authorization provided by the permit will be extended to participating enrollees through certificates of inclusion (COI) issued by LDWF.

The Louisiana pinesnake programmatic CCAA has not been finalized, and thus no enrollment has been initiated. The extent of landowner participation and subsequent conservation benefits are yet to be determined; therefore no conservation benefits to the Louisiana pinesnake from the programmatic CCAA are considered in this proposed rule.

Concentrating effort by using the LRSF-Model to guide priorities, LDWF has been approaching landowners in the Louisiana pinesnake's range in Louisiana to recruit them into the Natural Areas Registry Program (Gregory 2013, pers. comm.).

Landowners agree to protect the area and its unique natural elements to the best of their abilities, and they can receive, free of charge, an annual ecological check-up on the health of the plants, animals, or habitat of special concern, and preparation of a management plan.

Additional research and survey efforts are being funded by the Texas Comptroller's office as part of the "Keeping Texas First" initiative. The research is underway and being conducted by Texas A&M University; research results are expected to provide additional information on the species' habitat requirements in Texas, which may contribute to future conservation efforts. Surveyors are expected to access suitable habitat on private lands that have previously been unavailable.

Effectiveness of Conservation Efforts: In summary, forest management beneficial to the Louisiana pinesnake has occurred across significant portions of most Louisiana pinesnake EOHAs. The significant increases in the acreages of burning and thinning conducted have improved habitat conditions on many Federal lands that support Louisiana pinesnake populations (Rudolph 2008b, pers. comm.), and reduced the threat of habitat loss in those areas. On private land, there has also been habitat restoration and beneficial management, but it has not been as consistent and is generally on a smaller scale (i.e., less than about 3,000 ac (1,214 ha) in the Scrappin' Valley EOHA) than on Federal lands. The Bienville population, which appears to be the most abundant, has only about 1,700 ac (688 ha) of habitat currently managed specifically for the Louisiana

piresnake, and the home range of one Louisiana piresnake can be as much as 267 ac (108 ha).

There has been no definitive trend of increased trap success in Louisiana piresnake populations over time (Rudolph *et al.* 2015, p. 33; Pierce 2015, unpub. data). As just discussed, extensive habitat restoration efforts have occurred on Federal lands where the Louisiana piresnake occurs. Although the threat of habitat loss has been reduced on much of these lands, none of the populations has shown a definitive response to forest management conservation activities. Those Louisiana piresnake populations are already small, and the species has a low reproductive rate, so recruitment to the population may not be detected for several years. However, it is also possible that increases in snake abundance may not be captured by traps currently in operation because some newly-created suitable habitat may be in areas farther from the current trap locations.

Summary of Factor A

In summary, the loss and degradation of habitat was a significant historical threat, and remains a current threat, to the Louisiana piresnake. The historical loss of habitat within the longleaf pine ecosystem occupied by Louisiana piresnakes occurred primarily due to timber harvest and subsequent conversion of pine forests to agriculture, residential development, and managed pine plantations with only intermittent periods of open canopy. This loss of habitat has slowed considerably in recent years, in part due to efforts to restore the longleaf pine ecosystem in the Southeast. In areas occupied by the Louisiana piresnake on USFS and U.S. Army lands, mixed longleaf and loblolly pine forests are managed beneficially for the species through thinning, and through prescribed

burning of thousands of acres of forests every year. However, habitat loss is continuing today on private land due to incompatible forestry practices, conversion to agriculture, and urbanization, which result in increasing habitat fragmentation (see discussion under *Factor E: Other Natural or Manmade Factors Affecting Its Continued Existence*). While the use of prescribed fire for habitat management and more compatible site preparation has seen increased emphasis in recent years, expanded urbanization, fragmentation, and regulatory constraints will continue to restrict the use of fire and cause further habitat degradation (Wear and Greis 2013, p. 509).

Extensive conservation efforts are being implemented that are restoring and maintaining Louisiana pinesnake habitat for the Fort Polk/Vernon, Peason Ridge, Kisatchie, and Angelina populations. Those populations are not threatened by continuing habitat loss. Portions of occupied habitat of the Scrappin' Valley (approximately 50 percent) and Bienville populations (about 2.8 percent) of the Louisiana pinesnake are also currently being managed beneficially through voluntary agreements. However, future conservation on private lands, which can change ownership and management practices, is uncertain, and the remaining land in the EOHAs with suitable or preferable soils is generally unsuitable habitat because of the current vegetation structure.

Although the threat of habitat loss has been reduced in much of the Louisiana pinesnake's occupied habitat overall, the likely most abundant population has relatively little beneficially managed land, and none of the populations has yet shown a definitive response to forest management conservation activities.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Ongoing take of Louisiana pinesnakes in Louisiana for commercial, recreational, scientific, or educational purposes has not been previously considered a threat (Boundy 2008, pers. comm.). Removal from wild populations for scientific purposes is not expected to increase significantly in the future. Any potential overutilization would be almost exclusively to meet the demand from recreational snake enthusiasts. According to a 2009 report of the United Nations Environment Program—World Conservation Monitoring Centre (UNEP—WCMC 2009, p. 17), captive-bred Louisiana pinesnakes were advertised for sale on four German websites, and two U.S. breeders were listed on another website. However, current levels of Louisiana pinesnake collection to support the commercial captive-bred snake market have not been quantified. Reichling (2008, pers. comm.) and Vandeventer (2016, pers. comm.) stated that there appears to be very little demand for this species by private collectors; however, there are at least a few Louisiana pinesnake breeders, and the snakes were still featured in advertisements recently for several hundred dollars for one adult (Castellanos 2016, pers. obs.).

Given the restricted distribution, presumed low population sizes, and low reproductive potential of Louisiana pinesnakes, even moderate collecting pressure would negatively affect extant populations of this species. Webb *et al.* (2002, p. 64) concluded that, in long-lived snake species exhibiting low fecundity, the sustained removal of adults from isolated populations would eventually lead to extirpation.

Non-permitted collection of the Louisiana pinesnake is prohibited by State law in Texas and Louisiana, and most areas in Louisiana where extant Louisiana pinesnake populations occur restrict public access or prohibit collection. In addition, general public

collection of the Louisiana pinesnake would be difficult (Gregory 2008, pers. comm.) due to the species' secretive nature, semi-fossorial habits, and current rarity.

Previously in Texas, TPWD has allowed captured Louisiana pinesnakes to be removed from the wild by permitted scientific researchers to help supplement the low representation of snakes from Texas populations in the AZA-managed captive breeding program. Currently, LDWF does not permit the removal from the wild of any wild-caught Louisiana pinesnakes to add founders to the AZA-managed captive-breeding program.

Although concern has been expressed that Federal listing may increase the demand for wild-caught animals (McNabb 2014, *in litt.*), based on the best available information, we have no evidence that overutilization for commercial, recreational, scientific, or educational purposes is currently a threat to the Louisiana pinesnake.

Factor C: Disease or Predation

Like many other animals, the Louisiana pinesnake is potentially impacted by native and introduced predators.

Known natural wild predators of pinesnakes (*Pituophis*) include mammals such as shrews, hawks, raccoons, skunks, and red foxes (Ernst and Ernst 2003, p. 284; Yager *et al.* 2006, p. 34). All of these species are common in the range of the Louisiana pinesnake. Several of these mammalian predators may be anthropogenically enhanced; that is, their numbers often increase with human development adjacent to natural areas (Fischer *et al.* 2012, pp. 810-811). Birds, especially hawks, are also known to prey on pinesnakes (Ernst and Ernst 2003, p. 284; Yager *et al.* 2006, p. 34). In one Louisiana pinesnake occurrence record, the snake was described as being “in combat with hawk,”

presumably a predation attempt by the bird (Young and Vandeventer 1988, p. 204; Pierce 2015, unpub. data). Some snake species prey on other snakes, including pinesnakes. The scarlet snake (*Cemophora coccinea*) has been documented to prey on northern pinesnake eggs (Burger *et al.* 1992, p. 260). This species is found within the range of the Louisiana pinesnake. An eastern coachwhip (*Masticophis flagellum flagellum*), which is an abundant species in the Louisiana pinesnake's range, was observed attempting to predate a juvenile northern pinesnake in North Carolina (Beane 2014, p. 143). Speckled kingsnakes (*Lampropeltis getula holbrooki*) prey on pinesnakes (Ernst and Ernst 2003, p. 279), and one caught in a trap set for the Louisiana pinesnake was observed to have recently consumed another snake (Gregory 2015, pers. comm.).

Pinesnakes also suffer from attacks by domesticated mammals, including dogs and cats (Ernst and Ernst 2003, p. 284). Lyman *et al.* (2007, p. 39) reported an attack on a black pinesnake by a stray domestic dog, which resulted in the snake's death.

Invasive feral hogs are known to inhabit some Louisiana pinesnake EOHAs (Gregory 2016, pers. comm.), including the Catahoula Reintroduction Feasibility EOHAs (Nolde 2016, pers. comm.), and are known to prey upon vertebrate animals, including snakes (Wood and Roark 1980, p. 508). They will also consume eggs of ground-nesting birds (Henry 1969, p. 170; Timmons *et al.* 2011, pp. 1-2) and reptiles (Elsey *et al.* 2012, pp. 210-213); however, there is no direct evidence that feral hogs prey on Louisiana pinesnakes or their eggs. Therefore, at this time, feral hogs are not known to be a threat to the Louisiana pinesnake. The Service and USFS are currently engaged in feral hog population control throughout Louisiana and Texas.

Red imported fire ants (*Solenopsis invicta*), an invasive species, have been implicated in trap mortalities of black pinesnakes during field studies (Baxley 2007, p. 17). Red imported fire ants also occur in areas occupied by Louisiana pinesnakes and are potential predators of Louisiana pinesnake eggs and hatchlings (Parris *et al.* 2002, p. 514; Beane 2014, p. 142); they have also been documented predating snake eggs under experimental conditions (Diffie *et al.* 2010, p. 294).

While there are no documented occurrences of successful predation (excessive or otherwise) specifically on Louisiana pinesnakes, predation on pinesnakes has been documented (Burger *et al.* 1992, entire; Baxley 2007, p. 17; Ernst and Ernst 2003, p. 284; Ernst and Ernst 2003, p. 284; Yager *et al.* 2006, p. 34). Even with the assumption that the Louisiana pinesnake is currently subject only to natural, historical types and rates of predation without additional pressure from invasive predators (e.g., feral hogs, red imported fire ants), the synergistic effect of that predation, together with other known sources of unnatural mortality on the currently reduced size of remaining Louisiana pinesnake populations, constitutes a threat to the species.

Snake fungal disease (SFD) is an emerging disease in certain populations of wild snakes. It has been linked to mortality events for other species, including one juvenile broad-banded watersnake (*Nerodia fasciata confluens* [Blanchard]) in Louisiana (Glorioso *et al.* 2016, p. N5). The causative fungus (*Ophidiomyces ophiodiicola*) (Lorch *et al.* 2015, p. 5; Allender *et al.* 2015, p. 6) and evidence of disease have been documented in one Louisiana pinesnake. Symptoms of SFD (e.g., skin lesions) were found on one Louisiana pinesnake; scale clippings from the snake were analyzed and the causative fungus was positively identified (Lorch *et al.*, in press). However, while SFD

is suspected of threatening small, isolated populations of susceptible snake species, we currently have no evidence that SFD is negatively affecting Louisiana pinesnake individuals or populations. We know of no other diseases that are affecting the species, and, therefore, at this time, disease is not considered a threat to the Louisiana pinesnake.

Factor D: The Inadequacy of Existing Regulatory Mechanisms

In Texas, the Louisiana pinesnake is listed as State threatened, and prohibited from unauthorized collection (31 Texas Administrative Code [TAC] sections 65.171–176). As of February 2013, unpermitted killing or removal of native species of reptiles from the wild is prohibited in Louisiana (Louisiana Administrative Code, title 76, part XV, Reptiles and Amphibians, chapter 1, section 101.J.3(f)). Collection or harassment of Louisiana pinesnake is also specifically prohibited on USFS properties in Louisiana (USDA Forest Service 2002, p. 1). The capture, removal, or killing of non-game wildlife from Fort Polk and Peason Ridge (DOD land) is prohibited without a special permit (U.S. Department of the Army 2008, p. 6; U.S. Department of the Army 2013, p. 51). USFS’s land and resource management plans (KNF, ANF), the Army’s integrated natural resources management plans (INRMPs) (Fort Polk Main Post and Peason Ridge), and the Louisiana pinesnake CCA all require habitat management that is beneficial to the Louisiana pinesnake for the Kisatchie NF, Angelina NF, Fort Polk/Vernon, and Peason Ridge populations (see “Conservation Efforts to Reduce Habitat Destruction, Modification, or Curtailment of Its Range,” above). The Service has never been informed of any difficulties in the implementation or enforcement of the existing regulatory mechanisms that protect Louisiana pinesnakes by TPWD, LDWF, or Federal

land managers, and no occurrences of noncompliance, including killing of snakes, have been reported to us (see *Factor E* discussion, below).

Its habitat requirements being similar to that of the red-cockaded woodpecker, the Louisiana pinesnake receives indirect protection of its habitat via the protections of the Act provided for the endangered red-cockaded woodpecker, where it co-occurs with the red-cockaded woodpecker on Federal lands.

These existing regulatory mechanisms provide no protection from the threat of Louisiana pinesnake habitat loss and degradation on privately owned lands, including those which contain the Bienville and Scrappin' Valley populations of the Louisiana pinesnake. Private landowners within some occupied habitat of the Scrappin' Valley population have voluntarily committed to agreements with the Service to manage those areas with prescribed burning and to promote the longleaf pine ecosystem for 10 years.

In summary, although existing regulatory mechanisms appear to be adequate to prohibit direct harm to individual Louisiana pinesnakes across their entire range, and offer some protection to habitat on publicly owned land, they offer no protection to the already degraded, fragmented, and declining habitat that exists on private lands.

Factor E: Other Natural or Manmade Factors Affecting Its Continued Existence

The historical loss, degradation, and fragmentation of the longleaf pine ecosystem across the entire historical range of the Louisiana pinesnake have resulted in six natural extant Louisiana pinesnake populations that are isolated and small. Habitat fragmentation and degradation on lands in between extant populations (Rudolph *et al.* 2006, p. 470) have likely reduced the potential for successful dispersal among remnant

populations, as well as the potential for natural recolonization of vacant or extirpated habitat patches.

Small, isolated populations resulting from habitat fragmentation are vulnerable to the threats of decreased demographic viability, increased susceptibility of extirpation from stochastic environmental factors (e.g., extreme weather events, epidemic disease), and the potential loss of valuable genetic resources resulting from genetic isolation with subsequent genetic drift, decreases in heterozygosity, and potentially inbreeding depression (Lacy 1987, p. 147). Kwiatkowski *et al.* (2014, pp. 15-18) found that the wild populations of the Louisiana pinesnake had lower heterozygosity and higher inbreeding than what is expected from a randomly breeding population. Low genetic diversity in small, isolated populations has been associated with negative effects on reproduction in snakes (Madsen 1996, p. 116). Recovery of a Louisiana pinesnake population from the existing individuals within the population following a decline is also uncertain because of the species' low reproductive rate (smallest clutch size [three to five] of any North American colubrid snake) (Reichling 1990, p. 221). Additionally, it is extremely unlikely that habitat corridors linking extant populations will be secured and restored; therefore, the loss of any extant population will be permanent without future reintroduction and successful recruitment of captive-bred individuals.

Roads surrounding and traversing the remaining Louisiana pinesnake habitat pose a direct threat to the species. Population viability analyses have shown that extinction probabilities for some snake species may increase due to road mortality (Row *et al.* 2007, p. 117). In an assessment of data from radio-tracked eastern indigo snakes (*Drymarchon corais couperi*), it was found that adult snakes have relatively high survival in

conservation core areas, but greatly reduced survival in edges of these areas along highways and in suburbs (Breininger *et al.* 2012, p. 361). In a Texas snake study, an observed deficit of snake captures in traps near roads suggests that a substantial proportion of the total number of snakes may have been eliminated due to road-related mortality (Rudolph *et al.* 1999, p. 130). That study found that populations of large snakes may be depressed by 50 percent or more due to proximity to roads, and measurable impacts may extend up to approximately 0.5 mi (850 m) from roads. During a radio-telemetry study in Louisiana and Texas, 3 of the 15 (20 percent) Louisiana pinesnake deaths documented could be attributed to vehicle mortality (Himes *et al.* 2002, p. 686). Approximately 16 percent (37 of 235) of all documented Louisiana pinesnake occurrences were on roads, and about half of those were dead individuals (Pierce 2015, unpub. data). During Duran's (1998, pp. 6, 34) study on Camp Shelby, Mississippi, 17 percent of the black pinesnakes with transmitters were killed while attempting to cross a road. In a larger study currently being conducted on Camp Shelby, 14 (38 percent) of the 37 pinesnakes found on the road between 2004 to 2012 were found dead, and these 14 individuals represent about 13 percent of all the pinesnakes found on Camp Shelby during that 8-year span (Lyman *et al.* 2012, p. 42). In Louisiana and Texas, areas with relatively large areas of protected suitable habitat and controlled access such as Fort Polk, KNF, and ANF, have several roads located within Louisiana pinesnake occupied habitat, and there have been a total of eight known mortalities due to vehicles in those areas (Pierce 2015, unpub. data).

In addition, Dodd *et al.* (2004, p. 619) determined that roads fragment habitat for wildlife. Clark *et al.* (2010, pp. 1059-1069) studied the impacts of roads on population

structure and connectivity in timber rattlesnakes (*Crotalus horridus*). They found that roads interrupted dispersal and negatively affected genetic diversity and gene flow among populations of this large snake, and was likely due to mortality and avoidance of roads (Clark *et al.* 2010, pp. 1059, 1067).

Malicious killing of snakes by humans is a significant issue in snake conservation because snakes arouse fear and resentment from the general public (Bonnet *et al.* 1999, p. 40). Intentional killing of black pinesnakes by humans has been documented (Duran 1998, p. 34; Lyman *et al.* 2008, p. 34). The intentional killing of Louisiana pinesnakes by humans is not unlikely, but because of the species' relatively low abundance and secretive nature, it likely happens very infrequently and, therefore, is not considered a threat at this time.

On many construction project sites, erosion control blankets are used to lessen impacts from weathering, secure newly modified surfaces, and maintain water quality and ecosystem health. However, the commonly used polypropylene mesh netting (also often utilized for bird exclusion) has been documented as being an entanglement hazard for many snake species, causing lacerations and sometimes mortality (Stuart *et al.* 2001, pp. 162-163; Barton and Kinkead 2005, p. 34A; Kapfer and Paloski 2011, p. 1; Zappalorti 2016, p. 19). This netting often takes years to decompose, creating a long-term hazard to snakes, even when the material has been discarded (Stuart *et al.* 2001, p. 163). Although no known instance of injury or death from this netting has been documented for Louisiana pinesnakes, it has been demonstrated to have negative impacts on other terrestrial snake species of all sizes and thus poses a potential threat to the Louisiana pinesnake when used in its habitat.

Exotic plant species degrade habitat for wildlife, and in the Southeast, longleaf pine forest associations are susceptible to invasion by the exotic cogongrass (*Imperata cylindrica*). That plant species may rapidly encroach into areas undergoing habitat restoration, and is very difficult to eradicate once it has become established, requiring aggressive control with herbicides (Yager *et al.* 2010, pp. 229-230). Cogongrass displaces native grasses, greatly reducing foraging areas for some animals, and forms thick mats that restrict movement of ground-dwelling wildlife; it also burns at high temperatures that can kill or injure native seedlings and mature trees (DeBerry and Pashley 2008, p. 74; Alabama Cooperative Extension System 2005, p. 1). Its value as forage for pocket gophers is not known. Currently, cogongrass is limited to only a few locations in Louisiana and Texas, and is not considered a threat to the Louisiana pinesnake. However, cogongrass has significantly invaded States to the east of Louisiana, such as Alabama and Mississippi (Alabama Cooperative Extension System 2005, p. 1-4; USDA NRCS Plant Database 2016, p. 2), where it occurs in pine forests on Camp Shelby (Yager *et al.* 2005, p. 23) potentially impacting the habitat of black pinesnakes found there.

The effects of climate change are predicted to have profound impacts on humans and wildlife in nearly every part of the world (International Panel on Climate Change [IPCC] 2014, p. 6). One downscaled projection for future precipitation change within the historical range of the Louisiana pinesnake varies between increasing and decreasing, but the average change is between 0.1 in (0.254 cm) drier and 1.1 in (2.8 cm) drier from 2020 to 2039 (Pinemap 2016, entire). Precipitation is projected to decrease even more for the 20 years following 2039. Additionally, the average summer temperature in the species'

historical range is expected to increase by 2.7–3.5 degrees Fahrenheit (Pinemap 2016, entire). Increasing temperature and decreasing precipitation could potentially affect the pine forest habitat of the Louisiana pinesnake due to drought stress on trees, and the snake itself may be susceptible to injury from higher temperatures or from decreased water availability. However, the Service is not aware of any information that would substantiate those effects or how the Louisiana pinesnake might adapt to those potential environmental stressors.

Effects of native phytophagous (plant-eating) insect species on Louisiana pinesnake habitat may increase due to the effects of climate change. In a study that modeled the effects of the southern pine beetle (*Dendroctonus frontalis*) related to environmental variables, southern pine beetle outbreak risk and subsequent damage to southern pine forests were substantially increased when considered for four separate climate change scenarios (Gan 2004, p. 68). In the openings left in the beetle-damaged pine forests, hardwoods may become the canopy dominants, and invasive vegetation may be more likely to colonize (Waldrop 2010, p. 4; Coleman *et al.* 2008, pp. 1409-1410), both of which can decrease the amount of herbaceous vegetation that the Louisiana pinesnake's primary prey (Baird's pocket gopher) depends upon for food.

The Service considers the effects of increased temperatures, decreased precipitation, and increased insect impacts on the Louisiana pinesnake and its habitat due to climate change to be a potential threat in the future; however, because of the uncertainty of the rate, scale, and location of impacts due to climate effects, climate change is not currently considered a threat to the species.

Conservation Efforts to Reduce Threats Under Factor E

Efforts to reduce Factor E threats would have to address increasing the resiliency of individual populations by increasing abundance and decreasing mortality, or preferably both. Currently, there are ongoing efforts to reduce at least some types of mortality and to study the potential of increasing the number of wild Louisiana pinesnakes via introduction of captive-bred individuals.

As discussed above under *Population Estimates and Status*, efforts to reintroduce Louisiana pinesnakes have been conducted only at the KNF Catahoula District site, where the Louisiana pinesnake is not known to have historically occurred. So far, there have been no attempts to augment existing populations of Louisiana pinesnakes with captive-bred individuals. Reintroduction, with improved success, done in multiple populations where appropriate habitat is available, has the potential to eventually increase the number of individuals and populations, increase genetic heterozygosity, and alleviate presumed inbreeding depression in the populations, making them more resistant to threats described for Factor E.

As outlined in the CCA, the U.S. Army has committed to avoiding use erosion control blankets, and USFS is committed to trying to locate ATV routes outside of the boundaries of Louisiana pinesnake occupied habitat. Additionally, some improved roads on National Forests are also closed to the public during certain times of the year (e.g., September to February at ANF [U.S. Forest Service 2015, entire]), which should reduce the number of pinesnakes potentially killed by vehicle traffic during those times.

In summary, a variety of natural or manmade factors, alone and in combination with other factors, currently threaten the Louisiana pinesnake. Fire suppression has been considered a primary reason for continuing degradation of the pine forests in Louisiana

and Texas. Roads and rights-of-way, and fragmented habitat, isolate populations beyond the dispersal range of the species. Mortality caused by vehicle strikes is a threat because there are many roads bisecting Louisiana pinesnake habitat, and the remaining populations appear to be small and declining. The species' small clutch size may limit its ability to effectively counteract mortality. Other potential threats to Louisiana pinesnakes include SFD, erosion control blankets, insect and invasive vegetation effects on habitat, and malicious killing by humans. Overall, the threats under Factor E may act together and in combination with threats listed above under Factors A through D and increase their severity.

Proposed Determination

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the Louisiana pinesnake. Threats to the six known remaining Louisiana pinesnake populations exist primarily from: (1) Historical and continuing habitat loss and fragmentation (Factor A) primarily through land-use changes or degradation caused by fire suppression; and (2) synergistic effects from mortality caused by vehicle strikes and by predators acting on vulnerable, reduced populations (Factor E and Factor C).

Portions of habitat occupied by two Louisiana pinesnake populations on private land are currently being managed beneficially for the species (some through formal agreements with the Service), and conservation efforts on Federal lands, such as KNF and ANF, and U.S. Army lands at Fort Polk and Peason Ridge through a CCA in existence since 2003, have been extensive and successful in restoring suitable Louisiana pinesnake habitat. However, the lack of a definitive positive response by the species'

populations indicates that habitat restoration may take much longer than expected to increase snake abundance, especially when they are subjected to negative effects associated with small populations of animals (i.e., reduced heterozygosity, inbreeding depression) and mortality pressure from vehicles and predators.

A captive-breeding population of Louisiana pinesnakes is also being maintained across 18 AZA accredited institutions and 2 non-AZA partner institutions. This captive population, established in 1984, has been managed under an AZA Species Survival Plan (SSP) since 2000. As of March 2016, this captive-breeding population consists of 111 individuals (51 males, 53 females, and 7 unsexed). Since 2010, this population has provided 77 captive-bred Louisiana pinesnakes for release into the wild at the Catahoula Ranger District of the KNF. This reintroduction feasibility effort has shown that at least one of the 77 captive-bred Louisiana pinesnakes has survived for at least 4 years after release in optimal habitat.

The Act defines an endangered species as any species that is “in danger of extinction throughout all or a significant portion of its range” and a threatened species as any species “that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future.” We find that the Louisiana pinesnake meets the definition of a threatened species based on the severity and immediacy of threats currently impacting all populations of the species throughout all of its range. The species’ overall range has been significantly reduced, populations have apparently been extirpated, and the remaining habitat (on private lands) and populations are threatened by factors acting in combination to reduce the overall viability of the species.

We find that the Louisiana pinesnake does not meet the definition of an endangered species due to the existence of multiple populations within the species' range; the extensive habitat restoration and management efforts to benefit the species ongoing within occupied areas currently being managed by the USFS and U.S. Army, as well as similar efforts ongoing (albeit generally smaller and to a lesser extent) within occupied areas currently being managed on private lands; and reintroduction of captive-bred animals into the wild, which has shown some limited success (see *Catahoula Reintroduction Feasibility EOHA*, p. 32).

Since completion of the CCA in 2003, beneficial forest management activities conducted by USFS and the U.S. Army have been formally dedicated to conservation of the Louisiana pinesnake. Extensive habitat restoration efforts have occurred on USFS and U.S. Army lands where the species occurs, and those populations are no longer threatened by continuing habitat loss. The resulting increases in snake abundance may not be reflected in captures by traps currently in operation because some newly-created suitable habitat may be in areas farther from current trap locations. While it is difficult to show an increase in population size with a species that is so difficult to detect, it is reasonable to assume that these populations will benefit from improved habitat management over time.

The Louisiana pinesnake captive-breeding population provides some capability for population augmentation or re-establishing populations in areas with suitable habitat through the SSP. The goals of the SSP are to: maintain an assurance colony for wild Louisiana pinesnake populations, preserve or increase genetic heterozygosity into the future, preserve representative genetic integrity of wild populations, and provide

individuals as needed for research and repopulation for the conservation of wild populations. While reintroduction as a conservation tool is not universally accepted as effective for all animals, and the results of current reintroduction pilot efforts remain uncertain, the number (77) of captive-bred Louisiana pinesnakes released into the wild since 2010 demonstrates that captive-propagation efforts are successful, and provides the opportunity for reintroduction/augmentation to benefit the conservation of the species.

The Louisiana pinesnake is likely to become endangered in the foreseeable future because the remaining populations are small, isolated, subject to ongoing natural and unnatural mortality pressure, and to date have not shown a definitive positive response to habitat restoration. The species currently has almost no potential for natural recolonization between populations, and multiple significantly affected populations may be unable to recover even with the restoration of appropriate habitat. Half (three) of the known natural extant populations (i.e., Kisatchie, Scrappin' Valley, and Angelina EOHAs) have had no captures in several years and it is likely that they will be considered extirpated in 7 years or less based on our population determination criteria, unless occurrences are documented in those areas before then.

Future conservation of the two extant populations on private lands, which can change ownership and management practice, is uncertain. Portions of the occupied habitat on these private lands are being managed beneficially for Louisiana pinesnake, but there is no permanent commitment from the current landowners to continue such efforts; the other portions with suitable or preferable soils are generally unsuitable habitat because of the current vegetation structure. The Scrappin' Valley population is at risk of being considered extirpated, as discussed immediately above. The Bienville population

is one of the two largest populations; should the ownership of those lands change or the commitment to current habitat management efforts on lands supporting the population cease, it is likely that this large population would decline and could become extirpated within the foreseeable future.

Significant Portion of the Range

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. Because we have determined that the Louisiana pinesnake is threatened throughout all of its range, no portion of its range can be “significant” for purposes of the definitions of “endangered species” and “threatened species.” See the Final Policy on Interpretation of the Phrase “Significant Portion of Its Range” in the Endangered Species Act’s Definitions of “Endangered Species” and “Threatened Species” (79 FR 37578; July 1, 2014).

Conclusion

Therefore, on the basis of the best available scientific and commercial information, we propose to list the Louisiana pinesnake as threatened in accordance with sections 3(20) and 4(a)(1) of the Act. The six known extant populations are all relatively small, and all are subject to one or more of the continuing threats discussed above, making them all vulnerable to extirpation. We find that an endangered species status is not appropriate for the Louisiana pinesnake because while we find the threats to the species to be significant, ongoing, and occurring mostly range-wide, multiple populations continue to occur within the species’ range, and all of the populations’ occupied habitat or portions of it (including two of the largest populations) are currently being managed to provide more suitable habitat for the species. The two largest populations also have had

relatively consistent numbers of detections of individuals in the last 12 years. Captive-propagation efforts have been demonstrated to be successful, and while still unproven at this point, reintroduction pilot efforts provide the opportunity for efforts to re-establish new populations or augment existing populations to benefit the conservation of the species.

Critical Habitat

Section 3(5)(A) of the Act defines critical habitat as: (i) The specific areas within the geographical area occupied by the species, at the time it is listed on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed upon a determination by the Secretary that such areas are essential for the conservation of the species.

Section 4(a)(3) of the Act and implementing regulations (50 CFR 424.12) require that we designate critical habitat at the time a species is determined to be an endangered or threatened species, to the maximum extent prudent and determinable. Our regulations (50 CFR 424.12(a)(1)) state that designation of critical habitat is not prudent when one or both of the following situations exist: (1) The species is threatened by taking or other activity and the identification of critical habitat can be expected to increase the degree of threat to the species; or (2) such designation of critical habitat would not be beneficial to the species. As discussed above (see *Factor B* discussion), there is currently no imminent threat of take attributed to collection or vandalism for this species, and identification and mapping of critical habitat is not expected to initiate any such threat. In the absence of

finding that the designation of critical habitat would increase threats to a species, if there are any benefits to a critical habitat designation, a finding that designation is prudent is warranted. Here, the potential benefits of designation include: (1) Triggering consultation under section 7 of the Act, in new areas for action in which there may be a Federal nexus where it would not otherwise occur because, for example, it is unoccupied; (2) focusing conservation activities on the most essential features and areas; (3) providing educational benefits to State or county governments or private entities; and (4) preventing inadvertent harm to the species. Accordingly, because we have determined that the designation of critical habitat will not likely increase the degree of threat to the species and may provide some measure of benefit, we determine that designation of critical habitat is prudent for the Louisiana pinesnake.

Having determined that designation is prudent, under section 4(a)(3) of the Act we must find whether critical habitat for the species is determinable. Our regulations at 50 CFR 424.12(a)(2) state that critical habitat is not determinable when one or both of the following situations exist: (i) Information sufficient to perform required analyses of the impacts of the designation is lacking, or (ii) the biological needs of the species are not sufficiently well known to permit identification of an area as critical habitat.

As discussed above, we have reviewed the available information pertaining to the biological needs of the species and habitat characteristics where this species is located. On the basis of a review of available information, we find that critical habitat for Louisiana pinesnake is not determinable because the specific information sufficient to perform the required analysis of the impacts of the designation is currently lacking, such as information on areas to be proposed for designation and the potential economic

impacts associated with designation of these areas. We are in the process of obtaining this information. We will make a determination on critical habitat no later than 1 year following any final listing determination.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened species under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness, and conservation by Federal, State, Tribal, and local agencies; private organizations; and individuals. The Act encourages cooperation with the States and other countries and calls for recovery actions to be carried out for listed species. The protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Subsection 4(f) of the Act calls for the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning includes the development of a recovery outline shortly after a species is listed and preparation of a draft and final recovery plan. The recovery outline

guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery plan also identifies recovery criteria for review of when a species may be ready for downlisting or delisting, and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. If the species is listed, the recovery outline, draft recovery plan, and the final recovery plan would be available on our website (<http://www.fws.gov/endangered>), or from our Louisiana Ecological Services Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (e.g., restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their ranges may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and Tribal lands. If this species is listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost share grants for non-Federal landowners, the academic

community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the States of Louisiana and Texas would be eligible for Federal funds to implement management actions that promote the protection or recovery of the Louisiana pinesnake. Information on our grant programs that are available to aid species recovery can be found at: <http://www.fws.gov/grants>.

Although the Louisiana pinesnake is only proposed for listing under the Act at this time, please let us know if you are interested in participating in conservation efforts for this species. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as an endangered or threatened species and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402.

Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service.

Federal agency actions within the species' habitat that may require conference or consultation or both as described in the preceding paragraph include management and any other landscape-altering activities on Federal lands administered by the U.S. Forest Service and the Department of Defense.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to threatened wildlife. The prohibitions of section 9(a)(1) of the Act, codified at 50 CFR 17.31, make it illegal for any person subject to the jurisdiction of the United States to take (which includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these) threatened wildlife within the United States or on the high seas. In addition, it is unlawful to import; export; deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of commercial activity; or sell or offer for sale in interstate or foreign commerce any listed species. It is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to employees of the Service, the National Marine Fisheries Service, other Federal land management agencies, and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving threatened wildlife under certain circumstances. Regulations governing permits are codified at 50 CFR 17.32. With regard to threatened wildlife, a permit may be issued for the following purposes: For scientific purposes, to enhance the propagation or survival of the species, for economic hardship, for zoological exhibition, and for incidental take in connection with otherwise lawful activities. There are also certain statutory exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

It is our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify, to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a proposed listing on proposed and ongoing activities within the range of the species proposed for listing. Based on the best available information, the following activities may potentially result in a violation of section 9 of the Act; this list is not comprehensive:

(1) Unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting of the Louisiana pinesnake, including interstate transportation across State lines and import or export across international boundaries, except for properly documented antique specimens of these taxa at least 100 years old, as defined by section 10(h)(1) of the Act.

(2) Introduction of nonnative animal species that compete with or prey upon the Louisiana pinesnake.

(3) Introduction of invasive plant species that contribute to the degradation of the natural habitat of the Louisiana pinesnake.

(4) Unauthorized destruction or modification of suitable occupied Louisiana pinesnake habitat that results in long-term damage to or alteration of desirable herbaceous vegetation or the destruction of Baird's pocket gopher burrow systems used as refugia by the Louisiana pinesnake, or that impairs in other ways the species' essential behaviors such as breeding, feeding, or sheltering.

(5) Unauthorized use of insecticides and rodenticides that could impact small mammal prey populations, through either unintended or direct impacts within habitat occupied by Louisiana pinesnakes.

(6) Unauthorized actions that would result in the destruction of eggs or cause mortality or injury to hatchling, juvenile, or adult Louisiana pinesnakes.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Louisiana Ecological Services Office (see **FOR FURTHER INFORMATION CONTACT**).

Required Determinations

Clarity of the Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

- (1) Be logically organized;
- (2) Use the active voice to address readers directly;
- (3) Use clear language rather than jargon;
- (4) Be divided into short sections and sentences; and
- (5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in **ADDRESSES**. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act, need not be prepared in connection with listing a species as an endangered or threatened species under the Endangered Species Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

References Cited

A complete list of references cited in this rulemaking is available on the Internet at <http://www.regulations.gov> and upon request from the Louisiana Ecological Services Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this proposed rule are the staff members of the Louisiana Ecological Services Office.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361-1407; 1531-1544; and 4201-4245, unless otherwise noted.

2. Amend § 17.11 paragraph (h) by adding an entry for “Pinesnake, Louisiana” to the List of Endangered and Threatened Wildlife in alphabetical order under REPTILES to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
* * * * *				
REPTILES				
* * * * *				
Pinesnake, Louisiana	<i>Pituophis ruthveni</i>	Wherever found	T	<u>Federal</u> <u>Register citation of</u> <u>the final rule</u>
* * * * *				

Dated: _September 26, 2016_____

Signed: _____Stephen Guertin_____

Acting Director, U.S. Fish and Wildlife Service.

Billing Code 4333-15

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